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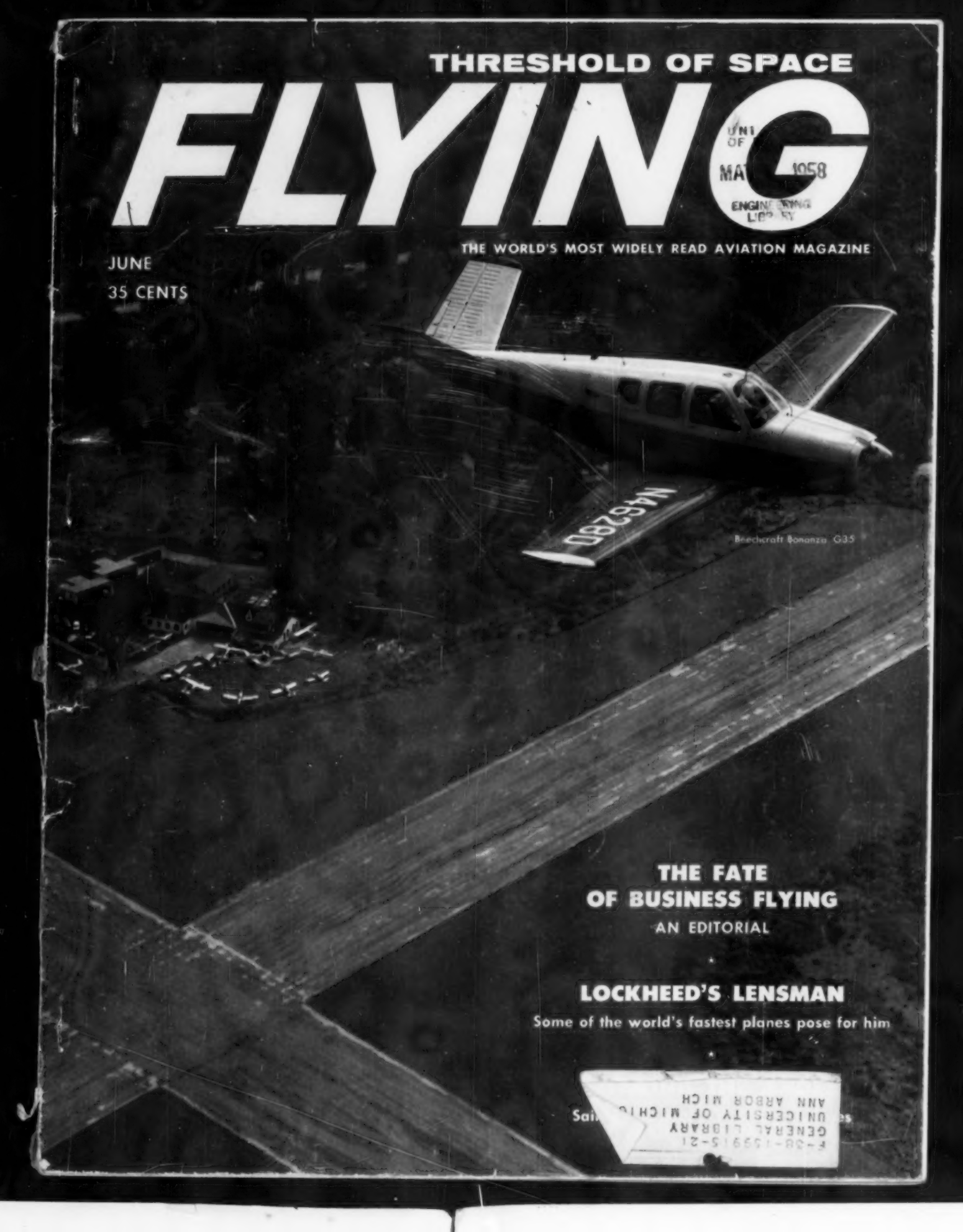

Beechcraft Bonanza G35

THE FATE OF BUSINESS FLYING

AN EDITORIAL

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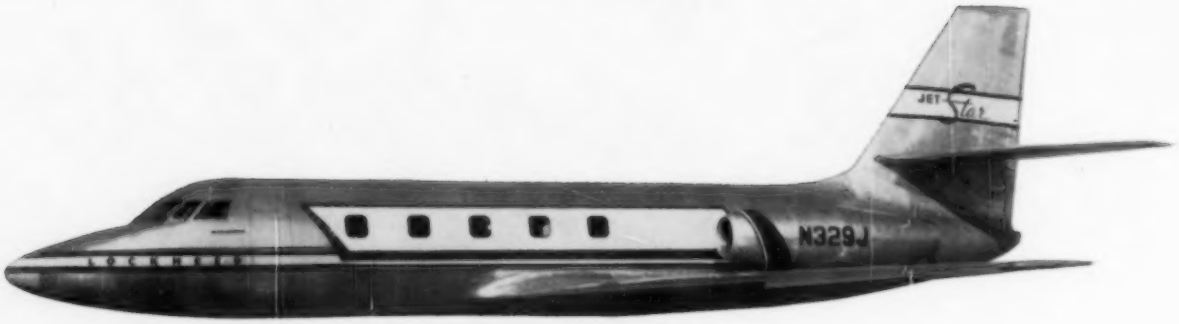

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FLYING®

JUNE, 1958 VOLUME 62, NUMBER 6

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THE COVER: James B. Taylor III, president of Upressit Metal Cap Corp., flies his company's Beechcraft Bonanza over Danbury (Conn.) Airport. The Danbury School of Aeronautics is visible in the background. Photograph by Anthony Linck.

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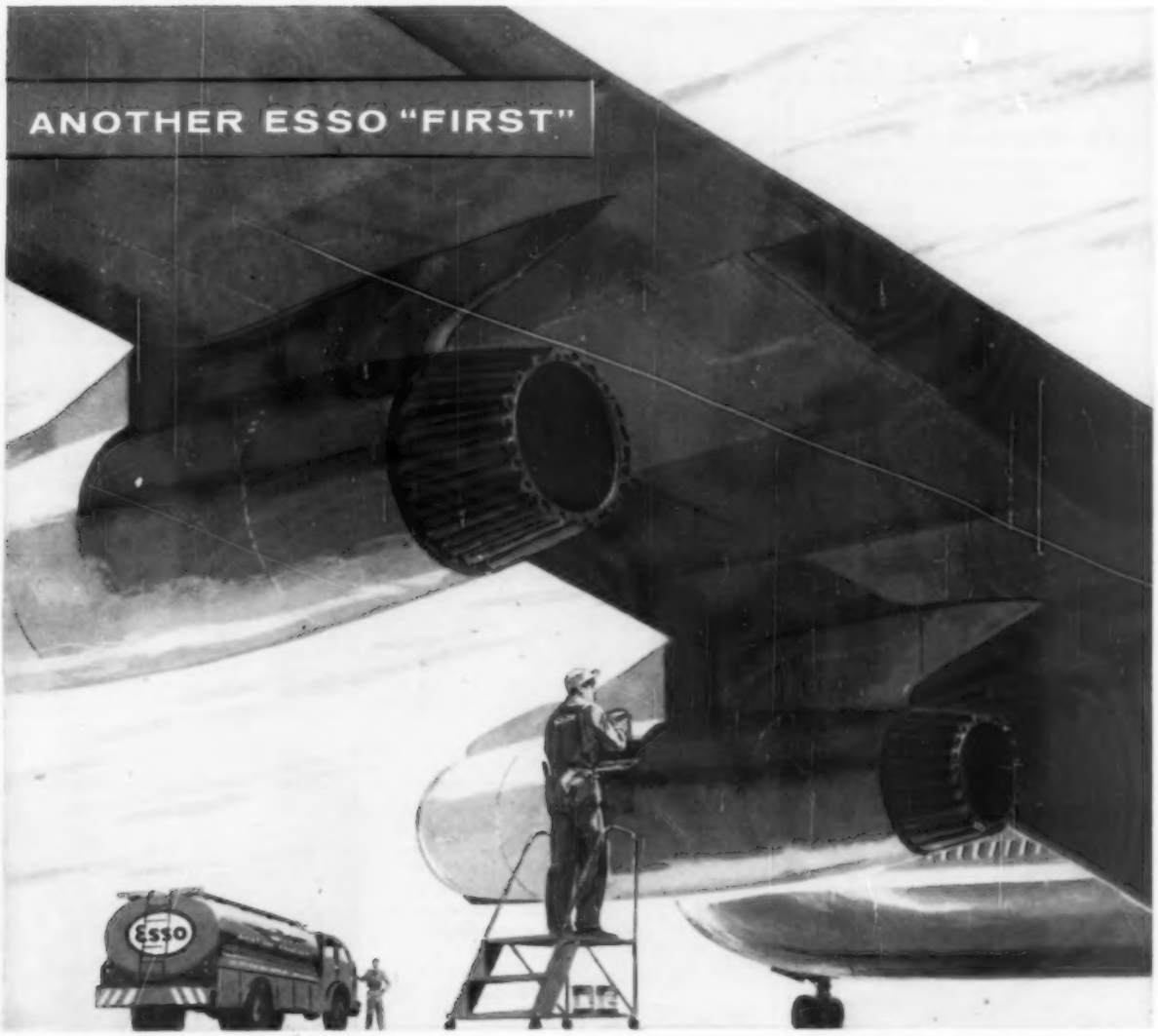

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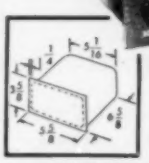

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MAILBOX

LIGHTER-THAN-AIR

I think congratulations are due to Mr. Bill Kreh and Cdr. George Cornelius, U.S.N. on their articles on LTA in the March issue of FLYING.

For many years I have wondered about lighter-than-air and I think these articles were delightful reading, and answered many of my questions. Thank you for such fine articles and keep up the good work.

PETER M. BELLMAN
Hasbrouck Heights, N. J.

T-EFFECT

Maj. J. P. Tracy's article "T-Effect—a New Phenomenon" in the March issue is very interesting to me. The main story concerns air conditions at night when there is a possibility of very smooth air conditions within the depth of a surface temperature inversion if the surface of the ocean is any colder than air overhead. If a stable air layer existed there is a possibility that the smooth airflow over the airfoil maintained the lift with decreased wing drag, very much as some wing models in low turbulence wind tunnels are said to show better lift drag ratios than in high-turbulence wind tunnels.

Maybe it is worth while to make a thorough investigation of both these phenomena even though flying so close to the surface cannot be recommended.

F. A. BROOKS
Member, American Meteorological Society
Davis, Calif.

INVISIBLE KILLER

Re: letter by Jack Bestic in Hangar Flying, March issue of FLYING: latest flyer from Karl Ort, York, Pa. lists surplus carbon monoxide detector for $24.89. If I remember correctly, this detector has been listed by him for about two years now. Might be a good investment for Mr. Bestic and anyone else who runs a chance of CO poisoning. Mr. Bestic is indeed lucky to have made it home.

NEIL C. TERHUNE, M.D.
Paxton, Neb.

Carbon monoxide poisoning has been and is a serious threat to motorists as well as pilots. I have had a similar experience as Mr. Jack Bestic.

I called upon a friend from Mine Safety Appliance Co., 7519 Penn Avenue, Pittsburgh 8, Pa., and bought at a very nominal charge (10 for $1.25) little ampules similar to smelling salts which can be broken and hung in the cockpit. A change in color of the sack detects very minute quantities of CO.

I carry them in my planes at all times; and when I am unusually fatigued or have even a slight headache, I hang one out and check for CO. Being a mining engineer, I know how easily noxious gas can cause death in the most stealthy manner.

FRANK A. BALCAR, Gen. Mgr.
B. B. R. Drilling Co.,
St. Clairsville, Ohio

BARNS INTRIGUE ME

The article in your March issue "Barns Intrigue Me," by Owen S. Billman, was of particular interest to me as I was the builder and designer of the Thomas Headless biplane which was sold to Earl Fritts, whom we taught to fly at the Thomas School of Aviation at Bath, N. Y., founded by my brother Oliver and myself in 1912 and run in conjunction with the Thomas Bros. Aeroplane Co. (Actually we operated under the name of Thomas Bros. from 1910 to 1912 when we incorporated.)

The picture of the 1910 Buick depicts quite a few early figures in the flying world and thinking there might be few

nowadays who could identify them, I offer the following: L. to R., Frank Jones, wing builder; Earl Fritts at wheel; Frank Burnside, Thomas and Thomas-Morse test pilot for many years; Walter E. Johnson, first Thomas test pilot and instructor in Thomas School; Wm. T. Thomas, President; Fred Eells, designer and builder of Eells Biplane; Ralph M. Brown, student in school and later shop supt. (now Pres., Penn Yan Boat Co.); Earl F. Beers, chief mechanic and student; Art Blasair, student and mechanic (who flew with Johnson in establishing American endurance record with passenger Oct. 1912 at Bath, N. Y., 3 hrs. 51 minutes).

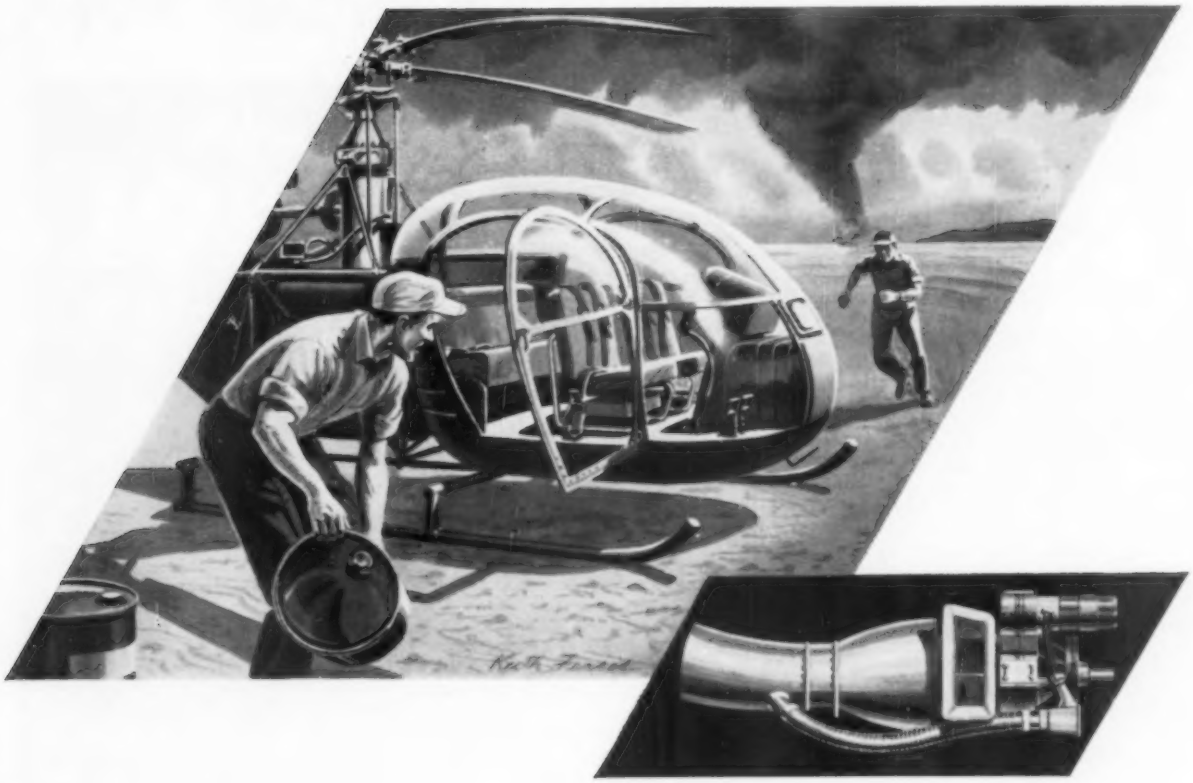
WILLIAM T. THOMAS
Daytona Beach, Fla.

Certainly am happy to see the old Thomas Company get some publicity concerning their early-day planes. . . . Shortly after Earl Fritts took his original Thomas plane back to Oneonta in 1913, I went with the Thomas Bros., and flew Thomas planes until I went into the Naval

(Continued on page 8)

ALOUETTE RESPONSE

FOR EMERGENCY NEEDS



Fighter pilots call it "Scramble" . . . but whatever the reason for rescue . . . high waters . . . the approaching twister . . . or escape from hazard to human life in any form, disaster may often be avoided if help is available at the point of danger. The new Alouette, world's first production turbine-powered helicopter, eliminates lengthy warm-up periods thus assuring practically instant take-offs to meet any emergency. ➤➤ The Alouette is assembled, tested and distributed in the U.S. by Republic Aviation Corporation, recognized for more than a quarter-century for its foresight, thus assuring in the exacting field of helicopter expansion . . . "Tomorrow's design—Today."*

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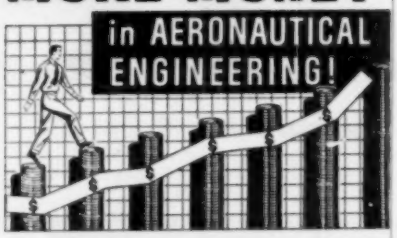

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MAILBOX

(Continued from page 6)

Aviation Service in WW I. . . . During 1912, I left a crated copy of a Curtiss Pusher in storage in Syracuse, N. Y., and I have never seen nor heard about it since.

JOHN H. (JACK) TWEED, Mgr.
New Haven (Conn.) Municipal Airport.

TALK GOOD LIKE AN AIRMAN SHOULD

. . . This is far and away the best coverage of this important subject that has yet been printed. ("Talk Good Like An Airman Should" by Capt. Chuck Banfe, in the March issue). . . . We propose to make it "must" reading for all instrument-pilot trainees at our school.

Capt. Banfe does fail to mention one highly important factor, however—the one which creates the most confusion for tower and communications station operators—failure of the pilot when making his initial call to *indicate the frequency on which he expects a reply.* This, the most frustrating and time-consuming of all, often results in no communication being established despite replies by the ground station on every available transmitting frequency.

GUY A. HAM, JR. Pres.
Cape Aircraft, Inc.
Glens Falls, N. Y.

Your March article "Talk Good Like An Airman Should" on page 46: Voice procedure for domestic use calls for "Point" instead of "Decimal," which is the ICAO practice only (see next to last line, Column 1, paragraph 5).

The term "Cruise" concerning an altitude is improper except in a peculiar situation relating to approaches (Col. 2, last C in the "Four C's"). The proper term is "Maintain."

Components of a clearance are better understood by beginners when categorized logically instead of initials:

1. Clearance limit and route
2. Altitude(s)
3. Reports and remarks.

A mike should be held (pg. 84) so part of it (or, part of the hand) contacts the upper lip or cheek. This keeps mike relation to lips constant, regardless of head movements or rough air effects. Better aircraft mikes have a small projection on their face for this purpose.

ALLEN W. HAYES
East Hill Airport,
Ithaca, N. Y.

● *We checked Capt. Banfe on the above letter and the CAA. Between the two we come up with this solution. "Point" is used generally on domestic flights and is* preferred *on international flights coming into and leaving the U.S.A. However, "decimal" is ICAO procedure; therefore when military and other aircraft required to use ICAO procedures use this term the tower replies in kind. In the case of "How Do You Read" and "How Do You Hear," the latter is ICAO, the former more commonly used. There is a general interchanging in the use of "Cruise" and "Maintain," but Mr. Hayes is quite correct in that the proper term, except in special situations, is "Maintain."—ED.*

ENGINE EXCHANGE

In April issue "Have You Seen," the Cessna 175 is said to be powered by a Lycoming GO-300A engine. My aircraft engine listings call it a Continental GO-300A.

Thank you and Bruce Reynolds for the wonderful story "Pioneer Mechanic." They truly were unsung heroes, as are modern mechanics.

JESSE H. WILLIAMS
Wichita, Kan.

● *The engine in the 175 is indeed a Continental. Cessna uses Continentals in its entire line.—ED.*

DITTO UNIV. OF FLORIDA

It is noted in the February issue of FLYING, on page 51, in the article "Flight Test Instruction at Iowa State," by D. W. Huigen, that Iowa State College is stated to be the only American college requiring "Flight Testing" as part of its academic schedule.

The University of Florida has included in its laboratory courses certain experiments in flight testing for the last eight years. There are no extra fees charged

the students for enrollment in this course, which is a regularly scheduled part of the curriculum in Aeronautical Engineering. A Navion aircraft is used in a similar fashion to that described in aforementioned article. . . . The enclosed photograph, taken in 1950, supports this letter.

JOHN W. HOOVER
Associate Professor
College of Engineering
Gainesville, Fla.

BACK ISSUES WANTED

I wish to furnish my aero-library with a complete set of 1950 issues of FLYING . . . please notify me of total cost. . . .

MAJ. MUHARTO KARTODIRDJO
Air Attache
Indonesian Embassy, P. O. Box 2719
Manila, Philippines

. . . I am writing you to ask if you know any place that I can buy Vol. 1 No. 1 to Vol. 10 No. 6 of Popular Aviation (FLYING) which would be approximately from July 1927 to June 1937, or about 120 copies. As an examiner for the Boy Scout Aviation Merit Badge I need these to help the Scouts. . . .

EDW. W. MUNZING
Apt. 247-44 Annunciation Rd.,
Roxbury 20, Mass.

● FLYING *editorial offices would also like to get its hands on some back issues to fill gaps in its own files. Drop us a note and let us know what you have.—ED.*

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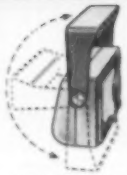
- It's the only portable radio that lets you play . . . and play safe for the low price of only $79.95*.



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Briefings . . .

ZENITH RADIO, Chicago, Ill., is on the market with a two-band, portable, all transistor radio, the Royal 760 Navigator. Powered by flightlight cells, the 3¾-lb. set is a super-sensitive receiver for both standard broadcast stations and weather

service on LF aviation bands (200-400 kc). Due to its exceptional sensitivity and range, no earphones are necessary and an outstanding feature of the set is its ability to serve as an emergency navigation aid, the azimuth scale on top giving relative bearings of stations from the plane.

CAA SAYS Flight Instructors *Ratings*, issued prior to Sept. 1, 1957, if not exchanged for a Flight Instructors *Certificate* prior to July 1, 1958, will expire on that date. If it expires, it will be necessary to acquire a new Certificate and complete written, oral and flight tests will be necessary. Before this happens exchange your present Rating for a Certificate at your nearest CAA Flight Operations and Airworthiness Office or with itinerant CAA Inspectors.

AFTER 20 YEARS at the same address in Toronto, Canada, the Aeroplane Photo Supply has transferred its massive supply of aeronautical books and photographs to England. Future requests should be addressed to the owner-manager C. G. B. Stuart, Fairlight Hall, Hastings (Sussex), England. Mr. Stuart in-

herited this 100-room castle some time ago and shipped his entire collection—14 tons of books and over 6,000 different photographs—to set up operations.

THE SUNDAY PUNCH used to launch the Jupiter "C" Rocket, which put the U. S. Explorers I and III into orbit was a new type, high-energy fuel developed by the Rocketdyne Div. of North American Aviation. Called Hydyne, it is based on a derivative of hydrazine and provides considerably more thrust than the present alcohol-liquid oxygen combination. [Hydrazine, used to fuel the Me 163 rocket in Germany in WW II, contains nitrogen and hydrogen and is combustible when mixed with water.] In addition to its high energy, Hydyne has the added advantage of usage in any rocket without modifications to the engine or fuel tanks.

LONG ESTABLISHED at Conway, Pa., Taylorcraft, Inc., manufacturers of fiberglas single engine aircraft for private and agricultural uses, is soon moving to Connellsville Airport in southwestern Pa. The move to larger facilities will permit production expansion of at least 100 per cent, according to Taylorcraft's president, Ben Mauro.

VISITORS TO THE BRUSSELS FAIR will, no doubt, marvel at this tinted, ocean-blue, 52-foot globe. The ingenious exhibit by Pan American Airways was manufactured by Irvin Air Chute Co. of U. S. Rubber's vinyl-coated, 18 oz. nylon fabric. Air inflated, the globe houses a "Theatre of Stars" in which Pan Am films will be shown against an astral background of

moving clouds and star-filled sky. An elliptical satellite ring walkway, outside the sphere, permits a "walk around the world" for a close-up view of Pan Am's global air routes.

COMPLETE "FLUSH ANTENNA SYSTEMS" for all models of Aero Commanders are available from Santa Monica Aviation, Inc., Santa Monica (Calif.) Municipal Airport, Western Distributors for this aircraft. CAA-STC-approved, the complete kit sells for $346.18 f.o.b. Santa Monica. Kit includes two omni antennas, two broadband communications antennas, two new wing tips with flush navigational lights and a new vertical fin cap with rotating beacon provisions.

DESTINED FOR DEACTIVATION, Ardmore (Okla.) AFB has been optioned by the City of Ardmore to Temco Aircraft, Dallas and Greenville, Tex. for a modification, overhaul and maintenance facility. Now occupied by units of the Tactical Air Force, the base has three 7,200-foot runways. What facilities will be available to Temco are yet to be decided. The new operation, under direction of E. Fred Buehring, Temco's Greenville manager, is being undertaken to augment the work load of the Greenville branch.

MAKING THEIR ANNUAL CRUISE to the Caribbean, this group of Florida Aero Club flyers landed at Palisadoes Airport, Kingston, Jamaica on first of their four-day holiday. They also visited

Ocho Rios on the Island's north coast before returning to holiday headquarters at Montego Bay. Harry B. Collins of Miami, leader of the group, is seen second from right.

THE AIRULER, an all-in-one computer which eliminates the slide rule principal of other computers and has no moving parts, is a recent development of two Piedmont Airlines captains, W. W. Cox and Sanford R. Gilley, Jr. Designed for map navigation, the computer uses precomputed charts that are easy to read by the novice pilot. For the experienced pilot it can be a real time-saver. Priced at $4.95, it is available from Aviation Supply Co., Box 5316, Ardmore Sta., Winston-Salem, N. C.

LYCOMING has come out with a new six-cylinder direct-drive engine—Model 0-540-AIA—for business aircraft. The first application is slated for the more powerful Piper Comanche. Weighing 396 lbs., the engine develops 250 hp, giving an outstanding horsepower/weight ratio in its power class. It has received CAA Certificate No. 295. Featuring dynafocal mounting it uses minimum 91/96 octane fuel.

TOO BUSY EARNING A LIVING to learn to fly, until 13 years ago at the age of 62 years, Pilot Ray Henry flew to Wichita recently to take delivery of his new Beechcraft J35 Bonanza — his fourth plane. President and founder of Henry Engineering Co., a thriving rubber mold-

ing firm in Moline, Ill., Mr. Henry, now 75, flies around 200 hours a year and his total flying time is more than 1,100 hours. Physically as fit as most men half his age, Mr. Henry belongs to a select group (not more than 350, according to CAA) of active pilots over 70 years of age.

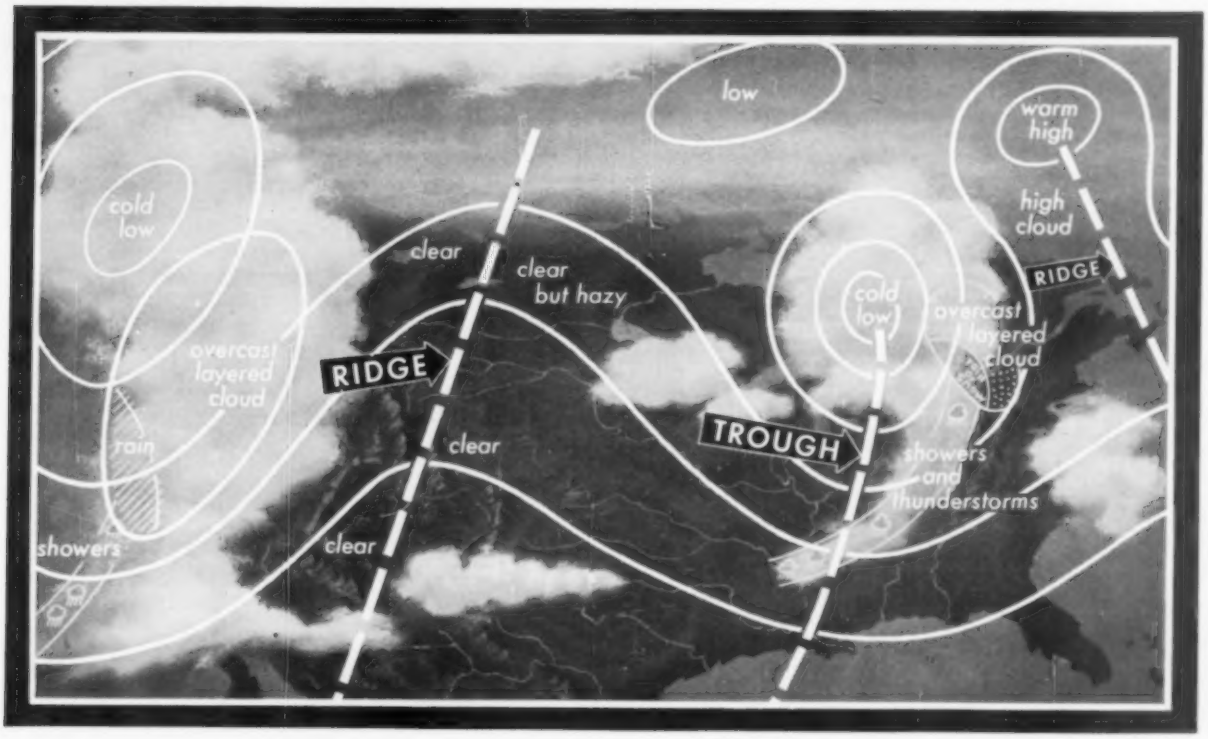
DARE, INC., Troy, Ohio, is marketing a new 10-watt transistorized amplifying speaker, designed for use as an output speaker in aircraft with one or more receivers or intercoms. Designed the DAS-1, the unit occupies no more space

(Continued on page 94)

Mobil

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau



CIRCULATION PATTERNS

Clockwise circulation of air around High Pressure areas and counter-clockwise flow around Lows in the northern hemisphere are well known to most pilots. However, there are some lesser-known features of Highs and Lows which have become apparent with the progress made in upper air analysis.

Warm Highs—Extend to levels above 10,000 ft. with temperatures generally warmer than Standard Atmosphere. As this type of High extends farther aloft, it often assumes an elliptical shape with major axis lying N/S to form a *Ridge*. This Ridge normally moves very slowly, blocking eastward movement of weather systems at lower levels, often causing prolonged periods of fair or rainy weather in adjacent areas. Weather in warm Highs is usually dry, fair and often hazy.

Cold Lows—Extend to high levels with temperatures generally colder than Standard Atmosphere. Their normal eastward movement slows until sometimes the center aloft becomes stationary or even retrogrades westward. This is called a Cold Low because of concentration of cold temperatures near the center. V-shaped elongation of these Lows toward the south is referred to as a *Trough* and marks region of wind shift and possible clear air turbulence.

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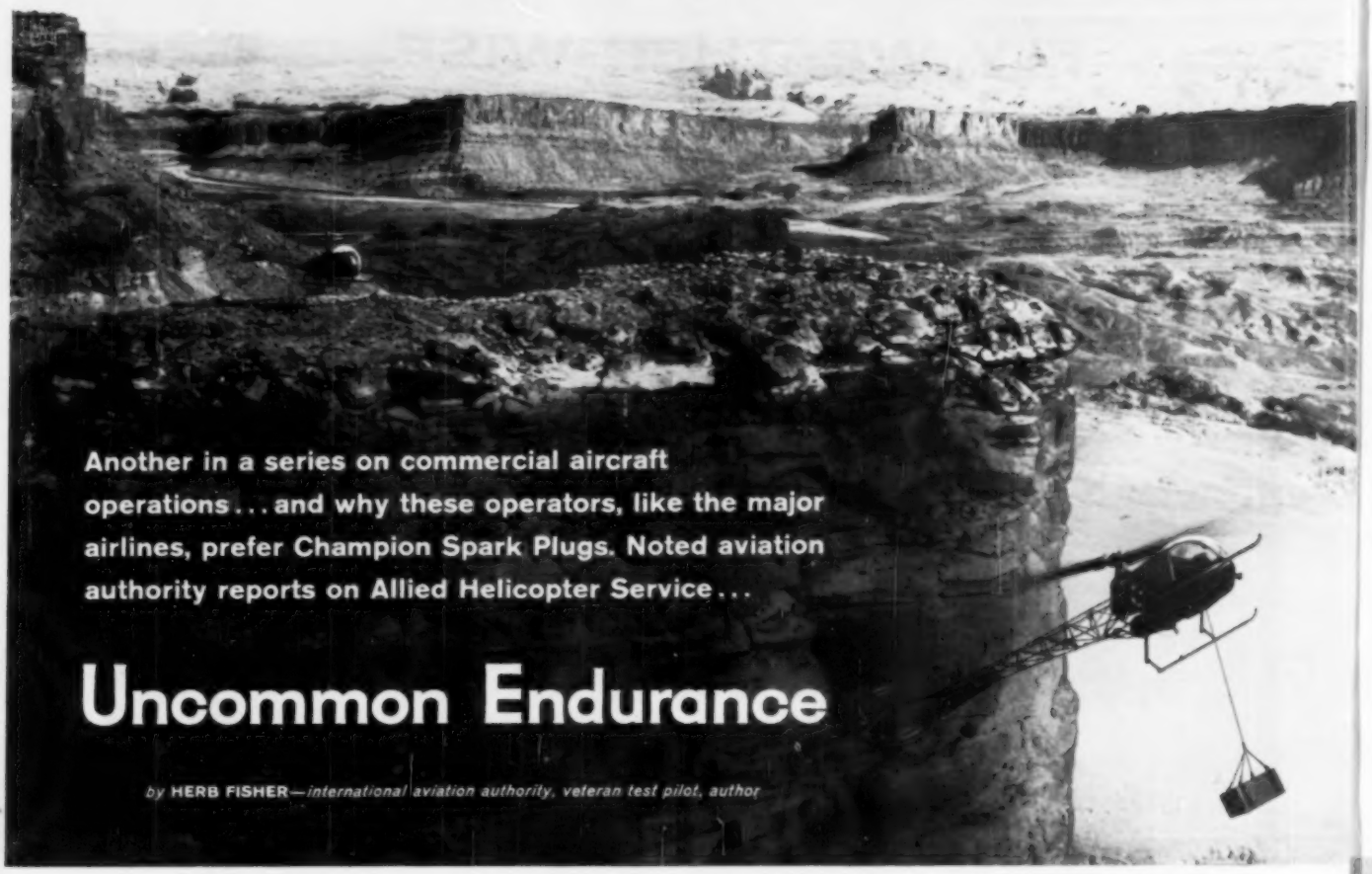


Another in a series on commercial aircraft operations... and why these operators, like the major airlines, prefer Champion Spark Plugs. Noted aviation authority reports on Allied Helicopter Service...

Uncommon Endurance

by **HERB FISHER**—*international aviation authority, veteran test pilot, author*

"Surveying, lifting machinery . . . bucking winds to hot, thin heights . . ."

The romance of the whirlybird is a dead duck so far as Allied Helicopter Service is concerned. Allied *works* its unglamourous craft—murderously.

Headquartered at Tulsa, this unusual eight-year-old "rugged-duty outfit" hires out on a world-wide basis—spraying, exploring, patrolling, surveying, hauling . . . frequently under almost unbelievably grueling conditions, jungle to Arctic.

As Roy B. David, Allied's President, told me: "For men, it's all *work*. For machines, it's just plain hell."

Herbert O. Fisher

A colorful Oklahoma attorney whose work in corporate aviation law led him to the founding of Allied, David speaks with undisguised admiration for his toiling helicopters:

"These are no dolled-up glamour birds. We tear them down, here in our shops—airframe to engine—down to the last nut and bolt. We custom-overhaul them from the ground up. We weld and innovate. We don't care how pretty they are. They've just got to be tough, beefed up to withstand terrific punishment.

"No engine goes in service until we've made it precision-perfect—able to take almost incredible overwork despite abrasive sand and humidity, subzero weather and hot, thin altitudes. That's why Champion Spark Plugs are so vitally important to us: *They insure dependability* of a good engine. Without a 100% dependable engine, you can wash out in short order in an operational grind like this."

SPRAYING, SEEDING

Allied's main operation now is crop and reclamation spraying—herbicides on pasture lands, forests, rights-of-way, canals and ditches, rice fields; insecticides on croplands, forests, cities—plus seeding of broadcast crops, pine forests, strip mines, grazing lands.

On the foreign front, Allied is spraying 50,000 acres of bananas per *month* in Guatemalan river-bottom. Eight 'copters plus pilot and mechanic crews are on the job. This operation represents a 5-million-dollar-a-year crop savings to banana growers, David said.

Rugged duty, for certain: With skids ofttimes touching banana leaves—darting in and out of jungle-bordered corners, day after day—each second of flight is critical. There can be no margin for error. Pilot, airframe and engine must be superbly *fit*:

"We pull our custom-tailored engines every 600 hours, clean spark plugs every 50," David said. "And fortunately for us, we can buy Champions in Guatemala City—as well as nearly any place else in the world.

"Helicopters, you know, work plugs much harder than do other aircraft, subject them to much severer operating conditions. When you consider that helicopter engines operate *constantly* at the high RPM that airplanes use only on takeoff — which means high electrode erosion and shorter plug life—this

Allied on oil survey . . . swamp near Morgan City, La.

(Advertisement)

should floor you as it has us:

"*Our plug life is 600 hours.*"

One of Allied's more spectacular home-front projects involves spraying 1,000,000 acres of mesquite in Texas and dense scrub in Oklahoma: "Remove that worthless mat and you'll have the best cattle country and farmland in the U.S.," reclamation experts had predicted.

"Carving farm and rangeland out of backcountry like that really gives our grasshoppers a workout," David told me. "And already a lot of that 'worthless mat' is cow-belly-deep in grass!"

On an "ordinary" herbicide and insecticide spraying job, I watched Allied 'copters clipping along the ground and shuddered. I watched them snuggle into corners of fields—right up to border vegetation and obstructions—then pivot sharply "at the last minute," spraying again, without drift, a return swath in three to five seconds. They'd land anywhere, anytime—taking on fuel and chemical in mere minutes. Then off again.

"That's real precision work," David said pridefully. "It's more than teamwork. Like the old cowhand and his horse, the helicopter pilot and his machine *must* operate as *one unit*. The man out there, Herb, is a *part* of his 'copter—and that engine is his heart. He wants it strong—fired to life by *dependable* spark plugs."

Allied has sprayed several thousand

"Spraying, skids raking foliage . . ."

miles of power line and railroad right-of-way from Texas to Illinois. A special controlled width device—developed by Ozzie York, Vice President-Maintenance and former RAF pilot—cuts a swath without harming valuable crops or timber to either side.

In Allied's vast forest and range reclamation projects, this equipment is used with chemicals that kill certain plant species without harming desirable vegetation: pine stands aloof and healthy, for example, while other trees and underbrush die.

SURVEYING

From Arizona to Alaska and Iceland, Allied has done government surveying and transplanting of heavy equipment and manpower where it's ofttimes impossible by other means.

In Iceland, Allied operated with the U.S. Army Map Service.

In Government uranium exploration in Alaska, Allied had to heat motor oil before it could be used: "I swear, when it's 40 below up there, I think we must have sometimes drunk the oil and poured hot coffee in the 'copters, so *un*romantic was *that* duty!" David said.

With the U.S. Geological Survey and Atomic Energy Commission, Allied 'copters invaded 17,000 square miles of some of the most inaccessible wilderness on earth—the Four Corners country of Utah, Arizona, Colorado and New Mexico. Here, Allied helicopters bucked wind currents from gorge bottom to heights where hot, thin air made hovering nearly impossible. They shuttled surveyors to hundreds of these pinnacles—averaging 8 to 10 miles apart — so they'd have abundant triangulation points for mapping 20- to 40-foot contour intervals. They lugged up machinery, explosives and timbers, and, between tasks—to test thermodensity lift—they'd haul boulders several thousand feet up from the canyon floors.

In Alaskan Geological Survey operations, 'copters pitched among icy mountains to cut field costs for mile-to-inch mapping from $25 a square mile to less than $8.

OIL EXPLORATION

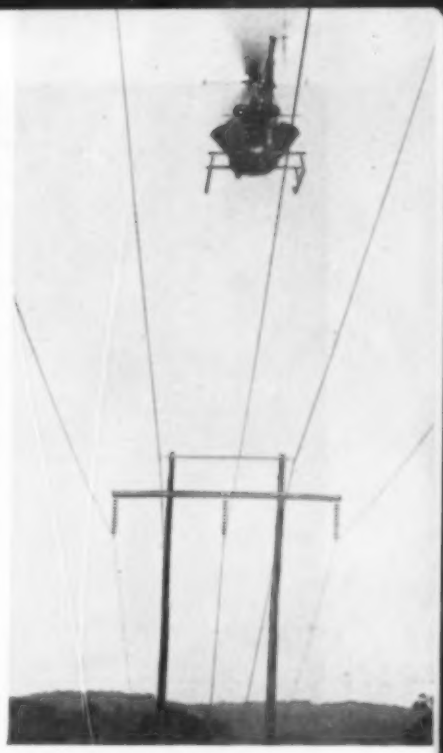
Allied has operated under contract to major oil companies from South American jungles through Louisiana swamps to the Canadian Rockies and Alaska.

Before first wells came in on now productive southwestern United States test sites, Allied whirlybirds were scouting the badlands for Gulf Oil. Explosives used in refraction shooting were shuttled quickly from "shot station" to "shot station" in this almost impossible country. Such treks previously took 100 men, each packing one case of dynamite, three days.

In Alaska and the Canadian Northwest, Allied's "grasshoppers" opened previously inaccessible areas for Phillips Petroleum, hauling supplies as well as flying geological survey missions.

In South America, Allied packed instruments, drills, explosives and camp supplies through dense jungles—covering in 45 minutes what had taken natives six

Night patrol . . . (r/l) Roy B. David, Allied President; Osvil York, V.P.-Maintenance



"Hustling along hazardous hot-wire trails . . ."

days to traverse. Here, Champions protected against hazardous flashover caused by hot, moist operating conditions.

In our own Gulf States, Allied air-lifted to isolated swamps everything from drilling apparatus to explosives. Seismograph crews didn't even get wet feet: the pontooned 'copters dragged surveyor chains, held the stake and flew sideways, up, down and backwards at the surveyor's signal.

PATROLLING

"Rugged" characterizes Allied's patrol duty, too.

With the Tennessee Valley Authority, for example, Allied 'copters skittered along 8,000 miles of high-voltage transmission line for 3½ years for a close check of line or insulator damage—impracticable by ground inspection.

On frost control projects in Oklahoma and Kansas, Allied flew low along telephone-telegraph lines so powerful rotor downdraft would jar accumulated ice off wires threatening to snap!

"Whether hopping about a pocked desert or combing bugs out of the jungles, it's *rugged duty* that you have to live with every day to really comprehend," David said. "It takes quite a crew, quite a craft, quite an engine—and, quite a spark plug. You can't buy a more serviceable, dependable spark plug than Champion. *We know.* We've got the operation to *prove* it —as I used to say in the courtroom—'beyond any shadow of a doubt.'"

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HANGAR FLYING

A BAD JAM

A LITTLE OLD round metal case of adhesive tape almost cost me and my teenage son our lives.

It happened three years ago. I manage the Pacific City air strip, just off Highway 101, 26 miles south of Tillamook on the Oregon Coast as well as run an airplane service shop, and teach flying. On that memorable day, a pilot from Willamina, about 35 miles east of here, flew in and wanted me to check the engine and give a 100 hour inspection to his Aeronca Champion. He complained that the engine was rough in a climb while hot.

I piled in, figured nothing much was wrong as the plane had flown in okay, and asked my son Bob if he would like to come along. We made a conventional take-off, climbed 2,000 feet, and leveled off. I'll admit the engine was a bit rough, but a little servicing would take care of that.

Then I started to check . . . first with turns for rigging. I made a 45-degree bank and 90-degree turn to the left and straightened out. Okay, then I made one to the right. The Aeronca turned fine, but when I went to recover, the stick stuck, it would not return to neutral, and I couldn't force it. Things then began to happen. The nose dropped sharply and we started into a screaming spiral with the airspeed registering 160 mph.

Luckily, I had instructed in aerobatics during 1947 and '48 in a GI training school, and knew that our only hope was

Author lifts roll of adhesive tape from floorboard well where it jammed the stick.

to roll the ship right on over. We went into inverted position and I shoved the stick forward to save altitude. I also gunned the engine to blow the tail down. The engine popped and sputtered, but we rolled over to a level position and the engine started up. I pulled back on the stick, throttled down, and came back to the air strip as carefully as I could.

We made a normal landing.

Eye witnesses testified that we had been less than 100 feet from the ground when we rolled out. I knew we had been below the level of the tall trees, and figured that we had been mighty close to smacking in at 160-plus mph.

When I inspected the ship the next day I thought that something had been wrong in the cockpit and, upon looking, found that the boot around the rear stick and floorboard was missing. Then I looked under the rear seat and in the baggage compartment, where I found the roll of adhesive tape bent out of shape. I figured it had wedged in the well between the stick and the floorboard, but fell into the compartment as we rolled over.

The Portland Safety District Office of CAA has that roll of adhesive on display. The near-death accident taught me a lesson to always, before every trip, look over the cockpit . . . front *and* rear, for loose objects. And I now make it a point to impress that on my students—and make sure that they do it.

HARVEY HENDERSON

Seattle, Wash.

ALTITUDE vs. LIFT

I WAS A PRIVATE pilot with a total of 70 hours on the morning that a friend and I drove out to the airport for a local sight-seeing tour.

Before moving to Albuquerque six months previously, I had never flown an airplane off an airport higher than 700 feet above mean sea level. My first flight in this mountain city had been an unnerving experience. I didn't check out that day and I didn't chance it again until cold weather came. Also I tried another airport. One with better runway conditions. Here, too, I found the people who ran the field friendlier and more sympathetic to the part-time, low-revenue pilot.

On the second try, I got a Cessna 120 with a peppier engine than the one used in my previous attempt. This combined with the colder air seemed to make it climb better than the J-3's I'd been flying back in Texas' low altitude fields.

That day the instructor checked me out, and as I gained a little experience my confidence returned. Then one day a fellow engineer expressed some interest in seeing his home from the air and I volunteered to take him up for a look-see the following week end.

On this particular morning there was a ten-knot south wind dead on the long runway (3,800 feet). Therefore, when the airport attendant warned me about some

(Continued on page 16)

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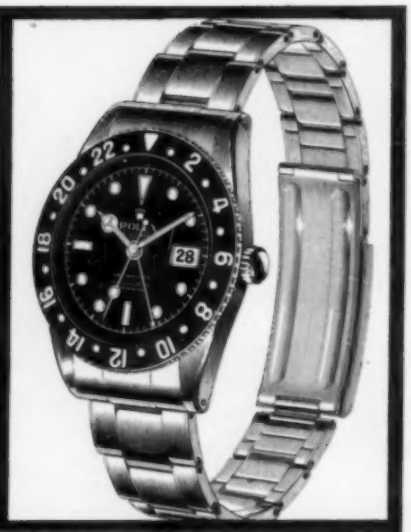

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Hangar Flying

(Continued from page 14)

repairs on the north end, I wasn't too disturbed. I merely decided to avoid the area at all costs. He told me that several loads of dirt were piled along the east edge of the north end of the strip and cautioned me about them.

We untied the Cessna and I ran through a ground check. The oil was down a quart so we pushed the ship to the gas pump and the attendant added a quart of oil and topped the tanks.

Tom and I crawled in, got a prop and we were on our way. I figured that the dirt blocked the far end of the taxiway so after a careful check of the traffic, including a road grader, I taxied on the east-west runway to the intersection. Here I turned north and continued till I reached the south end of the string of dirt piles. I figured that the best way to keep from busting the ship on one of those piles of dirt was to take off on the runway south of them.

I had a full load of gas (160 lbs.), a 180-lb. passenger, a 5,100-foot above sea level runway, with nearly half of it behind me! I could see the barbed wire fence that crossed the south end of the runway, closer than it actually was. But, what the heck, didn't I have a good headwind for the take-off? Reassured, I shoved in the throttle and started on a fast ride.

As the tail came up, I gauged the distance to the fence. Pretty close. I tried to ease it off but it dropped back. I let it roll and tried again, it plopped back to the dirt. To go on or not to go? Could I stop it in time? I decided we'd better go. Just as I made this decision I felt the wheels hit the soft sand. The fence was coming up. On the other side of it was a deep cut, then a fill for a highway with four big concrete pipes for drainage, a drop on the other side and trees. It wasn't just a matter of buying a fence.

I let it roll till I knew we would either fly or go through the fence, then I pulled it off gently. Maybe too gently. It came off at any rate. I held the nose down and came as close to the fence as I dared. A quick glance at the airspeed showed an indicated 45 mph. After the fence came the road. There were no trucks on it. I was worrying about the trees when my friend in the right seat asked casually, "Wasn't that a little close? You don't usually wait that long to take off, do you?"

We stirred the trees going over and I assured him that such a take-off was definitely not standard operating procedure.

I wasn't anxious to rush back and face that runway so we went through with our tour. Meanwhile, I thought my way through the inevitable landing. I decided that the dirt piled alongside the strip wasn't worth the trouble I'd gotten into trying to steer clear of it.

When the time came, I touched down *beside* the dirt, kept my eyes open and my feet on the rudder and never came close to it.

HUGH C. SUTTON
Albuquerque, N. M.

MILESTONES IN AVIATION

Flying to fame in the T-2

The Fokker T-2, renowned in its day as the "Flying Laboratory" for the Liberty engine, carried Lieuts. John Macready and Oakley Kelley to fame on two occasions. The first time was in 1922, when they stayed aloft in the T-2 for 36 hours and 5 minutes, breaking the world endurance record.

Then, in 1923, after two unsuccessful trials, Macready and Kelley piloted the T-2 in the first non-stop flight across the United States. Leaving Long Island at 12:36 PM on May 2, they just managed to get off the ground due to a heavy load of gasoline. Twenty-six hours and 50 minutes later, they landed the T-2 at Rockwell Field, San Diego.

The non-stop flight, made without guidance of beacons or lighted airways at night, showed that skilled pilots, in suitable planes, could traverse the United States in any direction without the need to refuel. The era of true freedom of flight was opened.

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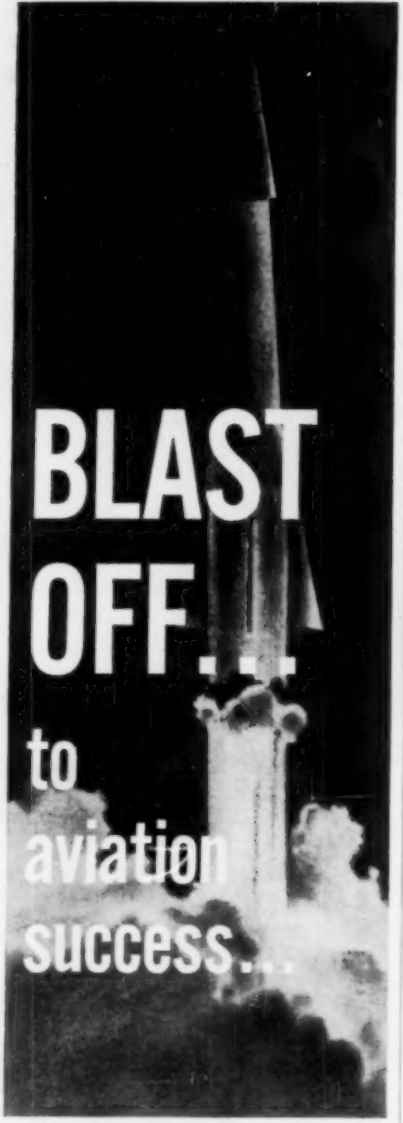

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HAVE YOU READ?

By JAMES F. SUNDERMAN

THE FASTEST MAN ALIVE, by Lt. Col. Frank K. Everest, Jr., USAF, as told to John Guenther (Dutton, $4).

On July 23, 1956 "Pete" Everest flew the Bell X-2 more than 1,900 mph at 60,000 feet (2,300 mph at sea level)—faster than any man has flown to date and survived. It was the ninth flight of the 100,000-hp rocket ship and Pete's last in the X-2, culminating ten years of test pilot duty.

His biography spans the years from youth in the West Virginia hills up to the top flight job in the Air Force—Chief Test Pilot; X-1 and X-2 flight project officer; and space pioneer. Test experiences embrace more than a dozen types of jets and turbojets, mostly fighters from the XP 59, first U. S. jet, through the Century Series. Multi-engine projects include the B-47, B-52, KC-135 and others.

Most interesting is Everest's personal account of testing the X-1 and X-2 which planes pushed the boundaries of aircraft design and construction far beyond the hopes of engineers and scientists. Everest's is the first detailed authentic presentation to appear to date. Much of the data was declassified by the AF specifically for Pete's use in the book.

Everest's historic 1,900-mph flight accomplished a major objective—expansion of speed/to Mach 3 and evaluation of handling and stability characteristics and of air friction temperature at that speed. In Everest's opinion the heat barrier simply does not exist.

In places the book captures descriptive passages of the awesomeness and unreality of space. Skirting its edges, Everest writes, "I felt like . . . Columbus and Magellan . . . awed and proud. Alone in a silent world, I was acutely conscious of its calm; a solitary human suspended in time and space."

Soft-spoken, iron-nerved Pete Everest crossed the frontiers of the air and walked the shores of the Star Sea. His story is an inspiring record of courage and imagination—a prelude to the great adventure ahead.

THE OTHER SIDE OF THE SKY, by Arthur C. Clarke (Harcourt, Brace, $3.95).

Perhaps airmen are fond of science fiction because so much of it comes true. It's a way to keep ahead of the game. Here is a book which will measure up—24 stories about space-flight to the moon and beyond; life in a space station; and colonizing the planets. The author is a prolific science writer, fiction and non-fiction. His most recent non-fiction work is, "The Making of a Moon"—the story of the Earth Satellite Program (Harper, $3.50). Published in late 1957, it describes Project Vanguard, treats of satellite construction, equipment, launching, orbiting relay of information back to earth, and of satellites as space stations.

UNDER MY WINGS, by Basil L. Rowe (Bobbs-Merrill, $4).

Another veteran airline Captain, now retired with more than 35,000 hours in everything from crates to DC-7s, logs the role he played in development of American aviation. Rowe's adventurous life in the air—stunt flying, barnstorming, air racing, test-hopping, pioneering new air routes in South America, and serving in two wars as a military air transport pilot—brackets a glamorous and proud era.

Basil Rowe develops his story chronologically from his first experience with aerodynamics in 1911—clipping the wings on chickens to observe their varying flight characteristics—to retirement as a senior PAA Captain.

A list of Rowe's contemporaries and flying associates during this eventful career reads like a plaque in aviation's hall of fame: Glen Curtiss, George Haldeman, Ruth Elder, Wiley Post, Eddie Stinson, Pegleg Ames, Clyde Pangborn, Roscoe Turner, Igor Sikorsky, Juan Trippe and others. His autobiography charts the paths of air progress these pioneers blazed across our skies. It contributes a full measure to the history and lore on the sky.

SAC: THE STRATEGIC AIR COMMAND, by Richard Hubler (Duell, Sloan and Pearce, $4.50).

Dick Hubler has written SAC's first full-dress book treatment—an informal highly readable, absorbing popular history. The story unfolds in terms of the concept upon which SAC is based. In developing this dramatic concept from its beginning, Hubler examines and analyzes the doctrine of deterrent airpower. Arguments of strategic airpower advocates and their adversaries are pitted against one other. The evidence is sifted for the reader to weigh. Rare items of various

(Continued on page 23)

Around the world... day after day

AC sparks the wonderful world of flight

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AIRCRAFT SPARK PLUGS

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FLIGHT-RIGHT BECAUSE THEY'RE BUILT RIGHT

ON THE FOLLOWING PAGES, SEE HOW AC SPARES
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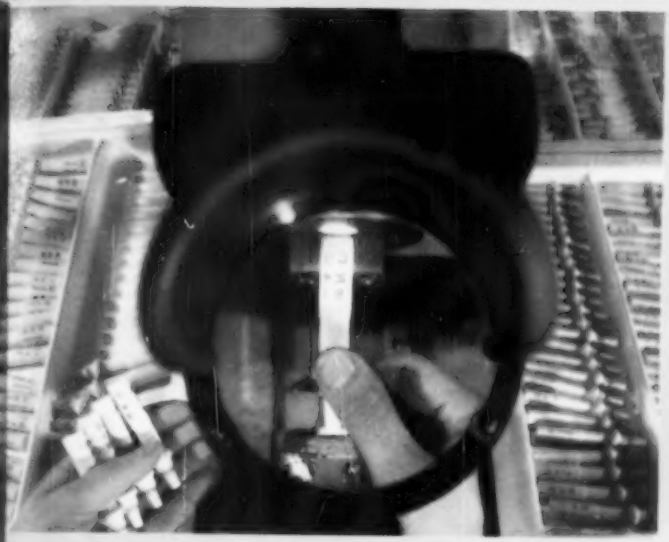

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Have You Read?

(Continued from page 18)

high level testimonials make exciting and revealing reading.

Rarely in recent years has a book stored a more meaningful and compelling experience for the reader.

PLANE CRASH! by Clayton and K. S. Knight (Greenberg, $4.50).

About 50 years ago the first air fatality wrote headlines across the country. The pattern hasn't changed. Air crashes still spell-bind the public.

Clayton and Katherine Knight select a series of major and minor air disasters beginning with the first—Lt. Tom Selfridge at Ft. Meyer, Va.—to illustrate main causes: weather, structural or design failure, and human error. Their purpose is twofold: through dramatic reconstruction to answer why and how; and to show the techniques utilized by aeronautical "gumshoes" in determining causes. The book strips much of the mystery from crashes and adds to growing safety knowledge and technique.

The American air safety record is impressive and improving each year. By discussing the air tragedies in a perspective of overall air traffic volume, the Knights present a timely and educational study—a service to the aviation world and to all Americans.

DOCTORS IN THE AIR, by Wing Commander Robert Maycock (Thomas Nelson & Sons, $3.75).

Despite the precision telemetering devices that exist, the only true benefits for mankind from rocket and missile flight will come when men crew the sleek objects. Machinery can report fact. It cannot judge, interpret, think or act like the human mind. And in the end, it is the aero-medical doctor who will install the human telemetering devices into the vehicles that probe the outer reaches of our solar system. Man must eventually be fitted to the machines of space.

Aero-medicine is fast coming into its own, and the sky doctor will soon be as important as the sophisticated missile technician. The aero-med specialist is no newcomer to the scene, but is receiving belated recognition. Throughout WWII he was ever present where flying was done. Wing Commander Maycock, a RAF "M.D.-pilot" offers a glimpse into the evolution and development of aero-medicine from the late 30's to present. Emphasis is on accomplishments in WWII when Maycock flew Spitfires in combat to better study the problems faced by the pilots at extreme altitudes, in violent acceleration situations, under sudden temperature changes, and in a variety of other flight circumstances, both physical and mental. The book is mainly a history of British aero-medicine, but it does touch upon American contributions, especially in post WWII years.

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The Fate of Business Flying

GILL ROBB WILSON
Editor and Publisher

WHEN THE MEAT'S TOUGH, one needs a sharp knife. And nobody in business today will deny that the bacon's harder to slice than has been customary for some time.

Corporations and individuals owning business aircraft and knowing how to use them will grow doubly appreciative of their advantage.

Businesses which have operated aircraft merely to keep up with the Joneses will either get rid of them or buckle down and put them to work.

Companies which have not investigated the potential of the business airplane for management efficiency and exploitation of new markets will now find compelling reason to do so.

I judge this period of recession in the public economy will be a healthy experience for the business airplane concept. Not only will it have marked opportunity to demonstrate its capability as a keen market tool in the hands of knowledgeable business, but it will emerge as having proven a decisive factor in the success of many companies.

The business airplane came into vogue in a period of comparatively easy money. This was a handicap. It led to the unthinking conclusion that the company aircraft was a management luxury. And in some cases this was true. There were just enough of these cases to becloud the entire issue. Despite the testimony of the majority, the impression persisted that, if times ever got tough, the tax-supported business planes, especially the ones which had been fully depreciated, would be sold for capital gains.

It will now be interesting to watch the used aircraft market. Operators who have a guilt consciousness about their aircraft as "luxury" items will be sliding out from under. Those who have found genuine business productivity in aircraft ownership will be chuckling in satisfaction. In this dividing of the boys from the men, the business fleet will forever rid itself of the "easy money", "tax support" stigma that was unfairly attached to it. Once this is accomplished, a potential purchaser of a business plane and an aircraft salesman will be able to get together on a new and more constructive footing.

Influences are mounting in favor of the business plane. Automotive traffic conditions have reached such a state that business travel by highway is increasingly uneconomic. Railway passenger accommodations are steadily shrinking and fares increasing. Trunkline air commerce moves eagerly toward hurtling higher, farther and faster. Feeder line air commerce lacks appropriate equipment to make money and expansion is a matter of increased subsidy. If ever a sharp tool of industrial and business mobility was needed in the organic nature of transportation, it is now. The corporation or individual failing to contemplate the small airplane under these circumstances is just not being realistic.

This does not imply, however, that the concept of the business airplane has clear sailing. Far from it.

The small aircraft manufacturer must take a hard look down the road ahead. There he will see that the professional pilot supply will become increasingly scarce. No longer will the overflow from the military establishments be numerically adequate to man the civil business fleet. Revolutionary simplification in the operation of private aircraft must be invoked. The supply of professional pilots will become a critical training problem even for scheduled commerce. More and more the businessman will be compelled to do his own flying and this he simply can not do under present piloting requirements.

Presumably, automation in the cockpit will be a major factor. There is nothing difficult about flying under ideal conditions of weather and visibility. Any normal individual can fly with less complications than he or she can drive a car. But when visibility is restricted or absent, nothing less than professional skill is adequate. This the businessman in volume can not acquire. Therefore the cockpit of the future business fleet must compensate for casual skill. If the aircraft manufacturer can accomplish this, his horizons are unlimited. If he can't, he will be a relic of the air age within a decade.

The helicopter approach to this problem is one avenue of exploration. The machine has inherent capabilities but here again the skill required to bring them out is of professional stature. To date that shuts out the businessman.

It may well be that capitalization in the small aircraft industry is inadequate to the research essential to the future character of the business fleet. In such case we would grieve for an industry of which we are inordinately proud. But it could be.

On the other hand, it could be that capital is adequate if the target could once be made clear above the smoke of routine conditions and current competitions. No one can fairly be dogmatic about this possibility. Conversely, the stake is such that to neglect studied consideration would be intellectually as well as economically unworthy.

We have a profound conviction that the national economy will increasingly require every ounce of industrial and business flexibility that can be developed. We believe the business fleet contains great promise to this end. We believe American business management to be the greatest force in the arsenal of democracy.

What development then could be more engrossing and significant to the national future than the adjustment of the business airplane to its potential? No airman or businessman but must expand the perimeters of his thinking in this respect.

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The aircraft industry must take the lead and direct the pioneering of the space age. Furnishing the hardware will not be enough.

Aspects of the Space Race

By MICHAEL CLARKE

DEVELOPMENTS of the cold war in the phase that is now euphoniously called the dawn of the Space Age, have brought numerous vital topics into much sharper focus than they ordinarily might have been, or were as recently as eight months ago.

Some of these topics have been discussed at length in Congressional hearings and in public forums. Others have not been so well publicized but are equally important. In both categories they include such subjects as the future of the aircraft industry; the progress of the atomic-powered aircraft; the development to date of the anti-intercontinental ballistic missile; and the effect of the newly created Advanced Research Project Agency (ARPA).

In this period of dynamic and radical change, with guided missiles being integrated into the Air Force, the aircraft industry, particularly the large airframe manufacturers who traditionally have depended upon the military for a large share of their business (in some cases all of it), faces a complex problem.

Most of them have been diversifying in one form or another, in many cases getting into the business of building both air frames and engines for the new missiles.

There is, however, an even more serious problem confronting them within foreseeable years. Present missiles, either air-breathing, as in the case of the Snark, or ballistic in character as are the Thor and Atlas, all require an actual airframe of some kind, just as do the manned aircraft, because all utilize liquid propellants.

However, preponderant Air Force thinking is to the effect that the day of liquid propellents for missiles is limited; that within five years, solid propellents will be sufficiently advanced to replace present liquid fuels. Solid propellent missiles, as now envisioned, do not require an airframe in the established sense of the word. They will come in their own containers and these containers will actually be airframes. In the succinct words of one notable missile man, "If we want an IRBM, we will hook one can of solid fuel to an engine and a warhead. If we want an ICBM, we will hook on three cans."

This is, of course, greatly oversimplified, but there is little doubt of its effect on airframe manufacturers. The containers for the solid fuel will most likely be made by the companies which manufacture the fuel itself—because they know how.

This does not infer the end of either liquid fuel or of airframe manufacture. In the first place the foundation of airpower is logistics and military logistics has many transportation responsibilities aside from the delivery of firepower on target. Additionally, just one stage beyond the present-day missile, comes the space ship, which could utilize liquid fuels. While more complicated to handle, some of the new "exotic" liquids have a much greater thrust than presently forseeable solids or atomic power. In any event, unlike the missile whose payload is only the warhead, the space vehicle will always carry some kind of a payload requiring an airframe, whether it be a simple orbiting satellite, a vehicle to reconnoiter the far side of the moon, or an actual manned space craft.

Airframe manufacturers probably are no different than the rest of us. We tend to cling overlong to established concepts and old loves. But it seems doubtful now that the Air Force will ever again be ordering vast quantities of airframes for combat use. The fighting vehicles of the future will be vastly more complicated. The entire packages could be produced in one plant. Instead of requiring 1,000 engineers and 10,000 workmen for production, the ratio may change to the order of 9,000 engineers and 1,000 workmen.

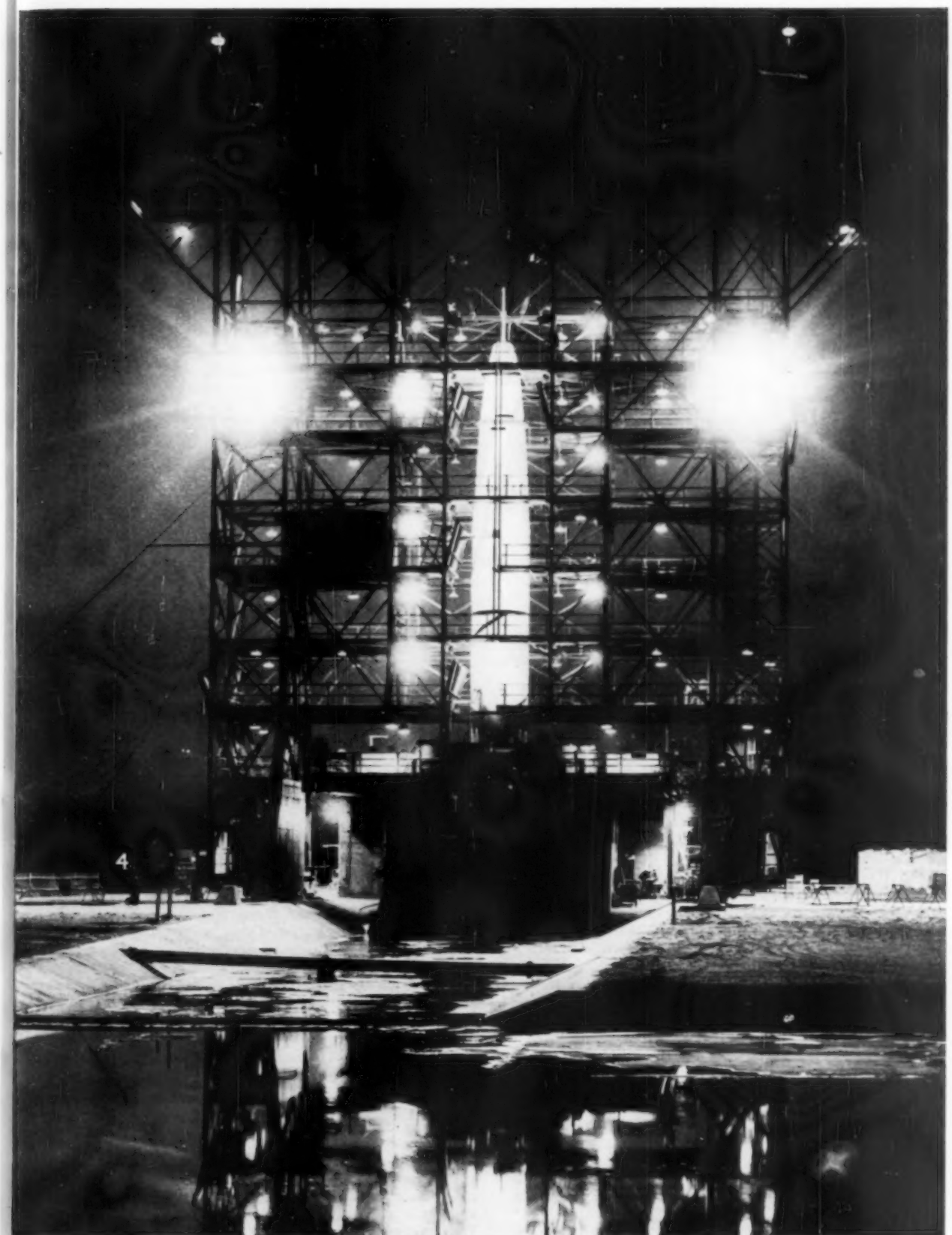
The only solution possible to the aircraft industry seems to be its capability to lead and direct the pioneering of the space age. Furnishing the hardware will not be enough.

To get at the story of the atomic-powered aircraft, it is necessary to go into the history of the project, originated by Gen. Curtis LeMay, the AF vice chief of staff, when he was Director of Research and Development in 1946. He, at that time, ordered a project to investigate the possibilities of using nuclear propulsion.

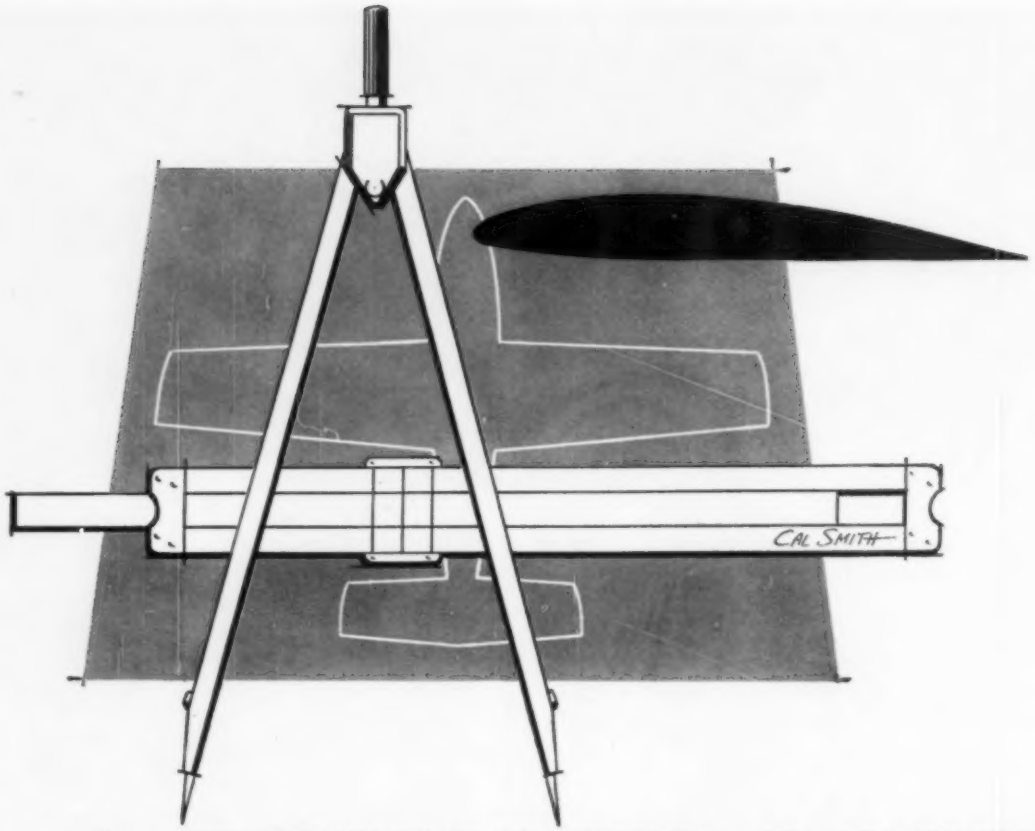
In 1946 the first contract was let to Fairchild Engine & Airplane Corporation for Project NEPA, Nuclear Engine-Powered Aircraft. Much of the original basic research was done by a Fairchild team working at Oak Ridge.

Some time later the atomic energy commission assembled a group of scientists to study the project and in 1948 published the Lexington Report. This said, in general, that a nuclear-powered aircraft was feasible, but that it would take ten years, would cost a billion dollars and would be extremely heavy due to the lead shielding.

Subsequently, in 1951, the Air Force and AEC established a joint project which became the Aircraft Nuclear Propulsion (ANP) program. In 1955 Air Force GOR-81, General Operational requirement, was published and given to the Air Research and Development Command, setting forth the Air Force re- (*Continued on page* 64)



The 1,500-mile range THOR, Intermediate Range Ballistic Missile, under development by the Air Force and Douglas Aircraft Company, Inc.



A DESIGNER LOOKS

I WAS SITTING AT THE COFFEE counter of the local airport the other day listening to a friend brag about the engine overhaul job on his Cessna. "Boy," he said. "When I push the throttle in now, she really gets up and goes."

"No," I said. "It doesn't."

He looked at me. He thought I had misunderstood him. "I said when I push the throttle in, she picks up speed and . . ."

"No," I said. "It doesn't go faster when you push the throttle in. It climbs. It only goes faster when you push the stick forward. When you opened the throttle, you unconsciously pushed the stick forward slightly to maintain altitude."

He thought it over. "That's splitting hairs, isn't it?"

I agreed that it was. "But that's what designers are—hair-splitters," I said. "They have an entirely different point of view about the airplane than has the pilot."

Take a simple thing like wing lift. Nine out of ten people will say that suction—an upward pulling pressure on the top of the wing, lifts the airplane. That idea is as old as the airplane itself but it is untrue. The air pushes *down* on the upper wing surface just as it pushes up on the lower surface; it just pushes down slightly less that's all. Some mathematician got mixed up years ago and defined a *reduction* in pressure as negative—or minus pressure, this lead to all sorts of misunderstanding—such as, vacuums, suctions, etc.

Take the average lightplane cruising along. The air you breath in the cabin may be at 14 pounds per square inch (altimeter setting 29.92 inches of mercury). The air pressure acting up on the lower surface of the wing may be slightly more than 14 pounds per square inch. *But* the upper surface has a down pressure acting on it of—say 13.9 pounds per square inch—only slightly less than the lower surface!

The difference, only 0.1 pounds per square inch, then gives you a normal wing loading of 14.4 pounds per square foot. The *reduction* in air pressure over the top of the wing therefore, is very small, nowhere near a "vacuum." That's why designers use rivets in tension on the upper wing skin. They'd be shot if they used rivets in tension elsewhere, though. In other words, if you sat on top of a wing you'd be unable to detect "vacuum" or "suction" of any kind; it's too small for a human being to detect. That idea of wing lift and suction got away from the designers one time and they never have been able to straighten it out since. But it's not the only explanation of things that come out of the past to haunt designers—and flyers. "Take your new tricycle gear for example," I asked my friend. "Like it?"

He beamed. "Even my wife can keep it on the runway now. Why didn't they put them on years ago?"

"They did," I answered. "It was one of the first things they thought of when they invented the airplane. But it had to be given up when they ran into a vicious design circle; heavy low-speed engines swinging huge propellers in front of a short nose. The nose was high off the ground. The planes had no wheel base. They had enough trouble maintaining conventional gears on rough unpaved fields

A veteran aircraft designer discusses prejudices and bugaboos, as well as some of the real problems, which have beset lightplane designers for over 20 years.

R. G. Naugle has been an airplane designer and aerodynamicist for 20 years. He started his career with Piper Aircraft Corp, and subsequently was associated with Taylorcraft, Fairchild, North American, Thiebolt Aircraft and McDonnell, among others. He designed the "Mercury" lightplane in 1940, and the Waterman Airlines cargo plane. Since that time, he has worked principally on fighter planes and missiles. He was Chief Project Engineer for the Air Force's B-36 from 1947-1950. But, as his article shows, Mr. Naugle's first love is the small plane . . . and he hopes to get back to building them, one of these days—soon!

AT THE SMALL PLANE

By R. G. NAUGLE

of the day. Brakes were in name only or not at all; you needed a high ground angle and a cast iron tailskid to keep the plane in the cow pasture after it landed. With modern brakes, more powerful, and compact engines, smaller propellers and smooth runways, nosewheels are simply a matter of cost and weight. Now when you're on the ground you can see everything you hit.

"Happy with your airplane?" I asked my friend.

"Generally speaking, yes," he answered. "Although there are some things I don't understand. They make a cabin for midgets; particularly the back seat. I can't sit there. My knees hit the back of the front seat and I have no place for my legs. Yet the whole rear fuselage is empty—why can't they move the rear seats back?"

"That," I said, "is a complaint I have heard thousands of times. Big guys like us crawl in and can't find anyplace to put ourselves. Back seats particularly. Actually, the designer isn't a sadist trying to make your ride uncomfortable. It's just that when you pull the rear seat back, you get into a fantastic design go-around. It shifts the center of gravity range and this necessitates complete redesign of the airplane. Suppose you move the rear seats back—say six inches. That may mean a rearward C.G. shift of an inch or two. Not much you say. The total allowable range is perhaps nine inches originally; adding even one or two inches keeps the designer up nights with a sharp pencil and a look of despair. He had enough trouble with the original nine inches!"

You immediately have control and stability problems. In fact, you have to move the main wheels back, and either increase the fuselage length or increase the size of the tail—or both. The tail size is usually selected for stability, so you can fly "hands-off" at rearward C.G. conditions. When you fly it with the C.G. forward, the controls stiffen up, the control forces increase and, in fact, there may not be enough up-travel in the elevator to stall the plane. Even take-off can become a problem; not enough control to raise the nose-wheel or, when it does come off, the plane may jump into the air and you have to push the wheel forward "right-now" to catch it. It porpoises. Furthermore, with the C.G. farther back, the plane will now readily spin as it stalls. In other words, moving the rear seats back is a very difficult design problem; it immediately involves a whole handful of problems that, at first, seem to have no relationship to the original purpose of providing more leg room. After all—the designer thought of it too!

How about cabin width? That's another classic argument with a 30-year history. It started out this way. Back in the days when designing an airplane was an art (meaning "your guess is as good as mine") it was known that fuselage drag depended on cross-sectional area and a mysterious thing known as a drag-coefficient. This coefficient depended on shape; and no one knew what the relationship was. Neither did any- (*Continued on page 84*)

A veteran airline pilot, Captain Lodeesen holds degrees in aeronautical engineering from the University of Michigan, as well as A&E and radio operator licenses. Right: Prognostic planning chart for Sept. 21 shows least-time flight tracks in solid lines. Flight of Aug. 18 (dotted line) shows the great variation possible in minimal flight planning. Below: The papier-mâché Boeing 707 turbo-jet superimposed over the fast-shrinking globe shadows today's comparatively low-and-slow intercontinental passenger flights.

Flying nowhere, Clipper X still provides a wealth of data and practical experience for the airlines which next year will start operational jet flights.

AS ANY PILOT MUST THINK well "ahead" of his airplane to stay safe, so must an airline to stay in business.

Not only must the choice of new equipment be right in relation to route structure, competition and past experience, but the new aircraft must be integrated smoothly into the system. This is usually a pretty tough job—doubly so for the turbo-jets which will go into regular service next year, due to lack of airline experience with the characteristics of this type of plane.

One phase of this preparation, inaugurated shortly after the commitment to buy jet transports was made, is the "Paper Jet Project." This is the pet name given to a series of studies on how to integrate these vehicles into an airline system formerly equipped with piston-powered craft.

Next best to actually flying the new planes, is to operate them theoretically. Not all the "bugs" can be ironed out in this way, but many can.

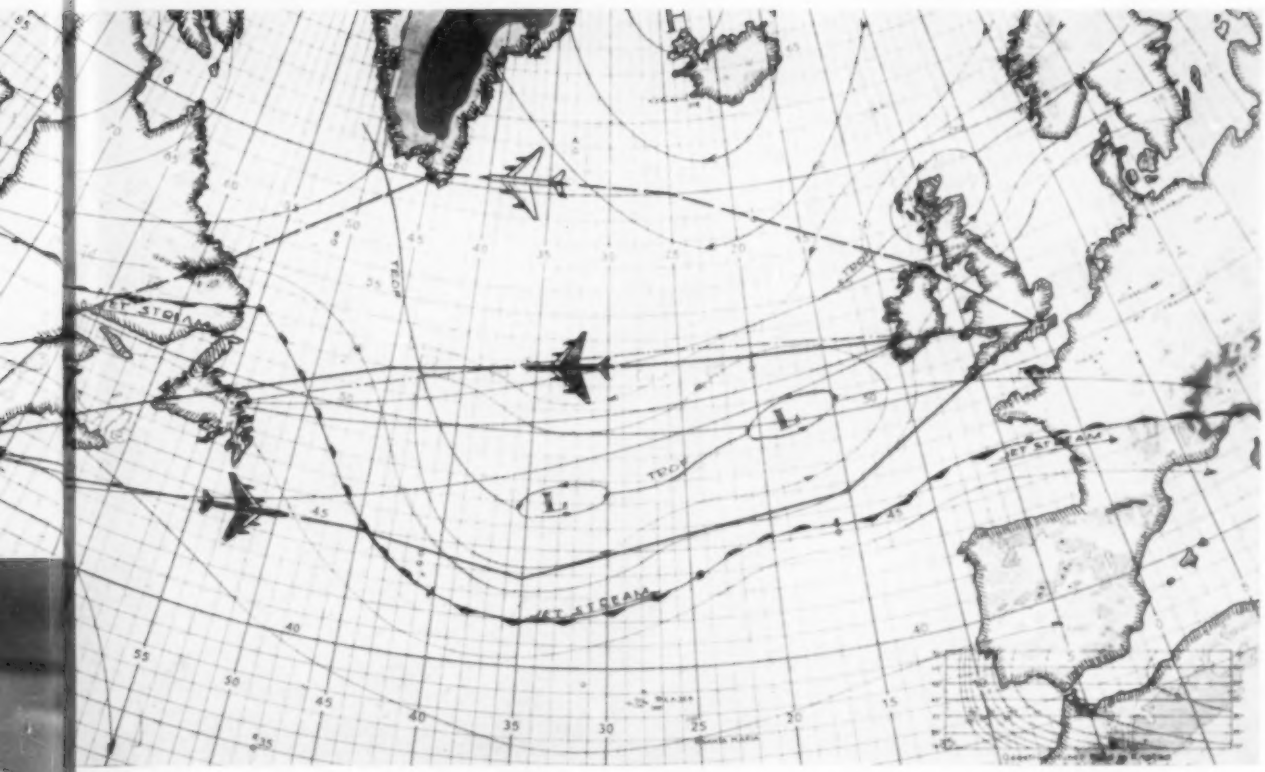
The backbone of this project is a daily scheduled flight of a Boeing 707-321 turbo-jet from New York to London and return. This provides staff experience in flight planning and weather forecasting for these faster, heavier, and in various ways, different airplanes. The project is so realistic that to the dispatchers at London, this flight of Clipper "X," which exists only on paper, is just as real as the actual flights of the luxury "President" to New York, or the "Rainbow" tourist to Chicago.

The results are twofold: the ground staff acquires practical experience; the wealth of data gathered will make the jets fit more easily and smoothly into the system.

Clipper X or Flight No. 1,000, Eastbound, Flight 1,001, Westbound, as these flights have been designated, flies the distance nonstop in six to seven hours at altitudes ranging from 30,000 to 40,000 feet. Take-off gross weight is 295,000 pounds; fuel capacity 23,800 gallons; passenger capacity 150, tourist configuration.

Flight Planning

Precision in flight planning is important for all aircraft types but assumes special urgency for turbo-jet-powered planes because their specific fuel consumption is affected so much more by cruising altitudes. Also, due to higher cost of aircraft operation, the selection of optimum conditions is of paramount importance. Once airborne, jet aircraft must proceed throughout the flight with minimum restrictions. Any major deviation from altitudes selected results in penalties which are operationally and economically extreme.



THE PAPER JET

By MARIUS LODEESEN

Captain, Pan Am

The flight planning is based on the same general lines as have been used heretofore: least-time-track selection; zonal winds and temperature forecasts; climb and descent wind and temperature computations; and areas of icing and turbulence.

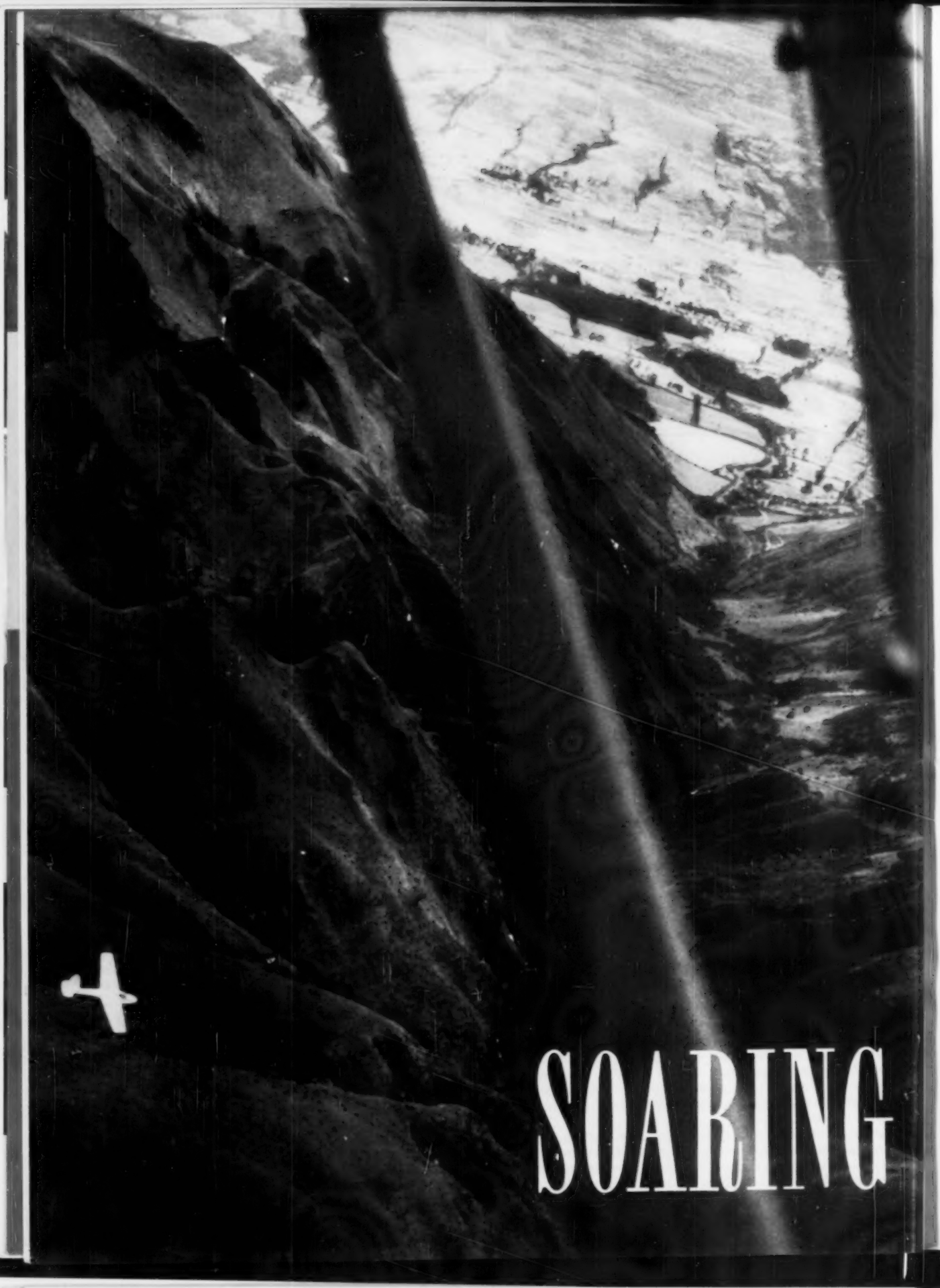
We will need to fly our expensive aircraft over the most economical route, which is the "Minimal Flight Path." The shortest distance between two points on the globe is, for the airplane, not necessarily the shortest in flight time. A recent technique enables dispatchers swiftly to find the least-time-track from the current weather map. A situation arose a few months ago where Clipper "X" would require 6:25 hours to fly the direct shortest route distance from New York to Paris. By swinging far south, intercepting the Jet Stream southeast of Newfoundland, and following it to a point south of the British Isles, the flight could be made in five hours and 45 minutes, a saving of 40 minutes. Figuring an operating cost of $1,000 per hour, this represents a direct saving of $660, with an indirect saving of much more.

Such departures from the straight line flight path are often spectacular. Not infrequently the Minimum-Time-Track on westbound flights from Europe swings far north over Greenland, reaching New York from the north so that the passenger's first view of that city is not from seawards but down the Hudson River from Albany. There is really nothing new in the "Least Time" principle. Early mariners knew all along that, to sail from England to America, one should set course to the south by way of the Canary Islands, then cruise along the 20th meridian to the West Indies and here change course for New York. Even though many leagues longer, the sailing time is much shorter, due to prevailing easterly winds along this track. Though the principle has been long known, it is only during the last years that a precise method has been found for determining the Least-Time-Track with accuracy.

The Jet Stream

Minimal flight planning is computed on 300 and 200 millibar weather forecasts equivalent to 30,000 and 40,000 feet altitude. At these altitudes, the effect of the Jet Stream is becoming increasingly important.

The Jet Stream is a strong band of winds swinging across the North Atlantic. The simplest explanation of the Polar Jet Stream is Confluence. This is nothing more than bringing together of cold and warm air masses which under certain conditions results in sharp frontal boundary aloft. The greater the frontal (*Continued on page* 52)


SOARING

The silent "White Bird" was always a source of wonder to the local Indians who gathered around it, carrying their most valuable possessions.

THE ANDES

The lofty peaks and deep gorges of Ecuador offer a challenge and adventure to the pilots of motorless craft.

By **CHARLES F. ABEL**
Captain, National Airlines

THE ROAD FROM GUAYAQUIL to Quito spirals upward from the sea like a corkscrew, each twist revealing some vista of breath-taking beauty. Ecuador, meaning equator in Spanish, is a tropical land with vast areas of uncharted jungle and towering snow-capped mountains.

To explore and chart new areas of action has to stir the imagination of any soaring pilot. As we wound and climbed northward up the rugged highway, Chicho Estrada, a dynamic young business executive, and Ecuador's ace soaring pilot, who had arranged our expedition, briefed me on the features of the landscape. As far as eye could see, the ranges and snowy summits of the Andes stretched away under a dust-free blue sky. The air was thin and crisp at our altitude of 12,000 feet, with well-formed altocumulus cloud still half again as high above us. A 25-knot wind whistled continuously across the slopes, indicating substantial lift for sustained soaring, along miles of steep slopes, in addition to thermal soaring under the clouds.

It was noon of a mid-August day when we stopped at a settlement of timber and bamboo dwellings to inquire about the progress of our advance party, which was convoying our sailplane and equipment on its two-day journey to Quito. A group of vehicles piled high with people and bananas blocked the narrow mountain road ahead, but the natives assured us that our equipment caravan was

Ernesto "Chicho" Estrada, Ecuador's ace soarer.

safe and proceeding slowly several hours ahead.

The sailplane, disassembled on its own trailer and towed by a Jeep, had made the best of a difficult trip. The switchback road, at times crowded with native vehicles, seldom permitted speeds of more than a few miles per hour and at each stop cadres of curious Indians had to be restrained from handling the fascinating mechanical bird. Eventually our barograph, with its constant clicking, punching pin-prick marks on the recording paper, indicated a gradual descent as we continued to jounce forward along the cobblestones. The outskirts of Quito began to unfold. It is nestled at the foot of the volcano, Pichincha, the cultural and historic center of Ecuador.

Next morning, the constant tolling of the church bells in the crisp dawn and the cries of the native street vendors, called us out of bed. From our hotel window, we had a magnificent view of the ancient monasteries and churches with dormant old Pichincha, towering another 7,000 feet as a background. Our other companions, Senor G. Hirtz, J. Elizalde, and E. Heckscher, had volunteered for photographic assignments. Senor Carlos de la Paz, an expert mountain pilot, was to fly the tow plane, with Chicho and myself handling the sailplane. Equipment for the photographic work included 14 various types of cameras, and sufficient black-and-white plus color film for 600 pictures.

Our sailplane, a Schweizer 1-26, which Chicho had constructed the previous year in Guayaquil from a standard kit, weighed 360 pounds with a 40-foot wing span, and was fully equipped for instrument flight. This ship with a 25 to 1 glide ratio, combined with its high maneuverability and slow landing speed, seemed suitable for high altitude flights. Although he never plans it so, a sailplane pilot must always be prepared to land in a small field away from an airport. Here at Quito, the possibility of having to sit down on a steep slope, or stall into a small pasture above 14,000 feet confronted us. For launching ourselves by airplane tow, we used a 150-hp Super Cub, which we anticipated would climb three to five hundred fpm to a satisfactory release point.

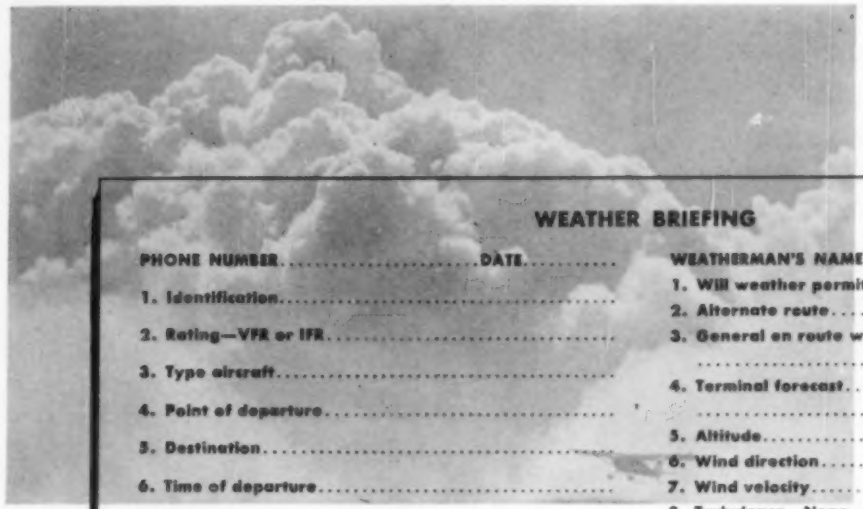
We were not able to obtain an official upper air analysis prior to our first flight, but judging by experience and checking a few "winds aloft" reports, an excellent soaring day seemed to be in prospect. The airport at Quito is 9,200 feet above sea level. Lying a short distance to the west, the volcano Pichincha rises to 15,500 feet. Several miles to the east another system of ridges runs north and south and, rising 1,500 feet above the airport, gave promise of great soaring adventure. With the "winds aloft" reports indicating 20 knots from the east southeast, we contemplated using the lift effect along this system for early morning soaring; then utilizing thermal currents later in the day for greater altitude and distance flexibility. A daily phenomenon, still unexplained to us, was the 180-degree change of surface wind each day during early afternoon. This caused us initially to move our complete operation from the north end of the airport to the extreme south border, much to the delight of the several hundred Indians, who really didn't believe the motorless machine would fly under any circumstances. Nevertheless, to lift the plane from its trailer, and commence assembly, we found dozens of the ever friendly natives crowding close to lend a hand.

Most modern sailplanes are designed for quick and easy assembly and disassembly, an absolute necessity for contest flying. Within 15 minutes our ship began to take shape. First the wings, then the tail were placed in position; bolts and pins inserted and safetied securely. The aft and forward canopies easily fell into place, and the job was finished. Chicho adjusted the barograph. A gentle breeze was blowing from the south with just a few wisps of clouds beginning to form. The mountain air was invigorating with the temperature at 58 degrees. During morning hours the sky is usually clear, with increasing cloud coverage in the afternoon. For the soaring pilot, who must always plan ahead, the day ends about an hour before sunset, which at Quito falls about 11:20 p.m. during August.

As the sailplane was being towed to the take-off position, we discussed procedure. Because of the high altitude, and since our oxygen system was inoperative, we concluded that flights should be limited to two hours each. Chicho would fly first. I would fly the tow plane first to determine best operating speeds; also seeking out areas of lift for faster climb to cut-off altitude. Our photographers, loaded with equipment, followed us out. It was 11:30 a.m. before final permission was granted by the official aviation authorities. The wind was now picking us, with altocumulus dotting the sky. As we walked to the sailplane, Chicho pointed across the field to "dust-devils", the soaring pilots visual thermal indicator. Time was not to be wasted.

Using a short, 175-foot, nylon tow line, we took off to the south, climbing through (*Continued on page 78*)

Line forms on the left. For the native children who swarmed, bug-eyed, over the sailplane, Chicho Estrada always had a good supply of candy.



WEATHER BRIEFING

PHONE NUMBER.....DATE.....

1. Identification.....
2. Rating—VFR or IFR.....
3. Type aircraft.....
4. Point of departure.....
5. Destination.....
6. Time of departure.....
7. Time of return.....
8. Experience.....

WEATHERMAN'S NAME.....

1. Will weather permit this flight?.....
2. Alternate route.....
3. General en route weather.....
4. Terminal forecast.....
5. Altitude.....
6. Wind direction.....
7. Wind velocity.....Temperature.....
8. Turbulence—None—Mild—Moderate—Severe
9. Frontal activity.....

Be sure to take advantage of the services offered to the private pilot by the weather bureau.

WEATHER FOR ME

By J. PATRICK PLUNKETT

SINCE BECOMING A PRIVATE PILOT four years ago, I've had an ominous feeling of inadequacy when checking weather. I have never been satisfied with the pre-flight briefing.

When planning a trip, I would call the bureau, ask for weather at my destination and three or four intermediate points. Inadequate and incomplete as it usually was, it seemed the best I could do—no explanation, no interpretation, just current weather at a number of points. I had the feeling the weatherman wanted to get rid of me as quickly as possible, and that he was a very impersonal guy.

I could not have been more mistaken!

After failing to complete the return leg of three consecutive business trips because of weather, I made up my mind either to find out how properly to obtain complete information, including some kind of forecast, or fly only for pleasure.

My job calls for me to travel the entire country from a midwestern city. On longer trips I use commercial airlines. On intermediate trips, whenever possible, I fly privately. But because I was getting stuck by en route weather so frequently, private flying for business purposes was becoming very expensive. I do not have an instrument ticket and, as a result, had no alternative but to sit out inclement weather.

Usually, having time on my hands around airports when flying commercial airlines, I decided to turn these idle waiting periods into something constructive. Many airports have a section of the weather bureau set up for private pilot briefing. Charts and forecasts are displayed and personnel on duty are eager to assist. Whenever possible, I made it a point to chat with the man on duty concerning my weather briefing problem. I talked to weathermen in Chicago, Toledo, Detroit, Cleveland, Indianapolis, Des Moines, Pittsburgh, Seattle and Los Angeles. All agreed that, if they were furnished with the proper information by the private pilot, a very complete and understandable briefing could be given.

Particularly of interest to me as a sidelight, I found while posing my problem to these weathermen, they are to a man, good Joes. Many of them are private pilots themselves. If you give them all the facts, they'll bend over backwards to help you. They receive many calls every day from pilots who check the weather just as I formerly did. These pilots ask for weather at their destination and a few other points, and that's it. Many don't even ask what conditions will prevail at their destination when they arrive. As far as the weatherman is concerned, if you don't identify yourself as a private pilot, all he knows is that someone is calling to check weather at a given point at the present time. I suppose most private pilots figure the way I did—that they will get current weather from the bureau and then listen for CAA broadcasts, or check with CAA en route. Checking in this manner is extremely (*Continued on page* 89)

THE AIRMAN'S WORLD

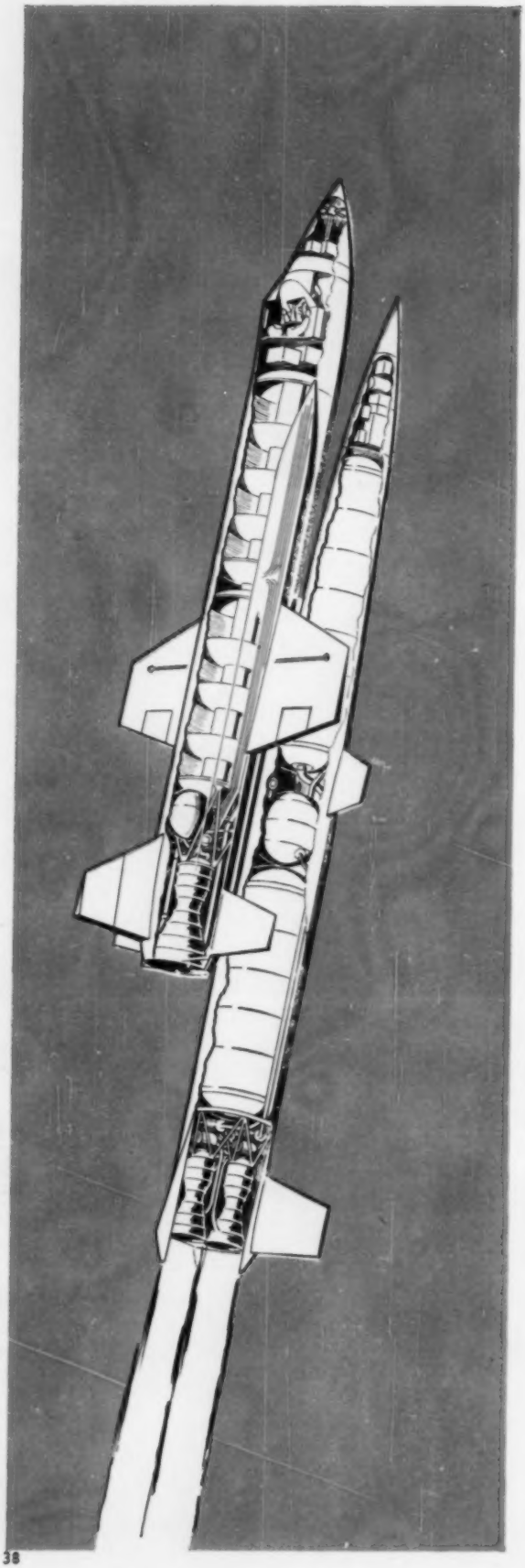
Who has not the love of his land as an impelling force in his life, has missed something of heaven on earth. None are so happy as the dedicated.

We who have inherited America are uniquely blessed in that our land is an inexhaustible source of inspiration for who has heart to respond to the things of the spirit. And I count it a thing of the spirit to walk on the open sky and to find rendezvous in the solitude where some spit of land offers haven by quiet waters. I count it as a source of wealth beyond the market to hang memory with paintings from the brush of one greater than da Vinci. I count it gold in the bank to have drawn something from the brooding hills and the restless rivers and the shores of the reaching sea. I count it as a joyous fate to be at one with the forces that sweep the waters to and fro in the tides, that move to divide the seasons, that restore life or decree decay for the bearded face of the forests.

To be at home with all that is our country is to have shared already something with eternity. And this the wing has made possible in vast measure for the citizen of the airman's world. In gentle journeys above the fatherland he has come to know that "Mine eyes have seen the glory." Landing in green pastures and beside still waters, he has drawn close to The Shepherd.

GILL ROBB WILSON

Photograph by Bob and Ira Spring.



By T. S. DONALDSON

An exclusive preview of the space vehicles in the headlines of to-morrow.

Threshold

IT'S LATE IN NOVEMBER '58. The modified B-52 bomber is leveling off at 39,000 feet. The "chase" planes slip into their observation slots below the fish-white belly of the 400,000-pound jet. As the final down-count begins, they are trailing their target by a scant hundred feet. The eyes of the pilots are focused on the tubular shape, half-faired in the B-52 converted bomb bay. It's the X-15, the free world's first spacecraft.

Now the monotonous downcount litany has come to the punch line. "Five, four tharree," chants the voice in the earsets. "Two . . . one . . . drop!" On cue, the gleaming white cylinder floats free of the bomber. At 550 mph, its stub wings easily support their 16-ton load; and the pilot forces it into a shallow glide only to be well clear of the mothership before he presses the stud that activates his rocket engine. Then the X-15 awakens. A stream of yellow-white fire trails in its wake—suddenly. Whitish lozenges, shock diamonds, seem to float in the white-hot column. In another minute, the X-15 has disappeared in the blue-purple sky—has been the first vehicle to take a human being out of this world and into space.

What kind of vehicle have we come up with in our drive to stake a claim in outer space? What can it do, and what kind of spaceship will follow in its wake? Let's take a look at the craft that will make the headlines of tomorrow —the vehicles of Man's first five years of space travel.

The X-15, North American built, was conceived in mid '54 as our first toehold in outer space. A project initiated under the auspices of the National Advisory Committee for Aeronautics, it was intended to take over where the Bell X-1A and B, the X-2, and the Douglas X-3 left off. However, Soviet spacecraft progress has given a new kind of importance to the X-15 program. Essentially the aircraft is not a combat type, although it will help shape many military space vehicles; nor designed for competition, even though it will set new records in almost every category you care to name. It is a sizeable ship, as test aircraft go—weighs about twice as much as the X-series rocket planes it succeeds, but calls on four times the thrust of the record-smashing X-2, ten times the power of the

Left: Cutaway of North American's X-15.

PART I

Next month, FLYING *will present the second installment of this timely, two-part article, which will deal with descendants of the X-15—The Satelloids.*

# of Space

X-1's. Its single-barrel, rocket engine, built by North American's Rocketdyne Division, delivers about 30 tons of thrust at full power. That's about the order of magnitude of Army's Redstone, the first stage vehicle of our pioneer satellite. When the X-15 is fully loaded, it can call on thrust double that of its own weight; a few moments before burnout, this ratio will be closer to 4:1. If you prefer the more down-to-earth denominations of horsepower, you'll be interested to know that at top speed, the X-15 is expected to move along with the help of 650,000 hp.

What kind of performance is possible with this kind of push? There are the estimates:

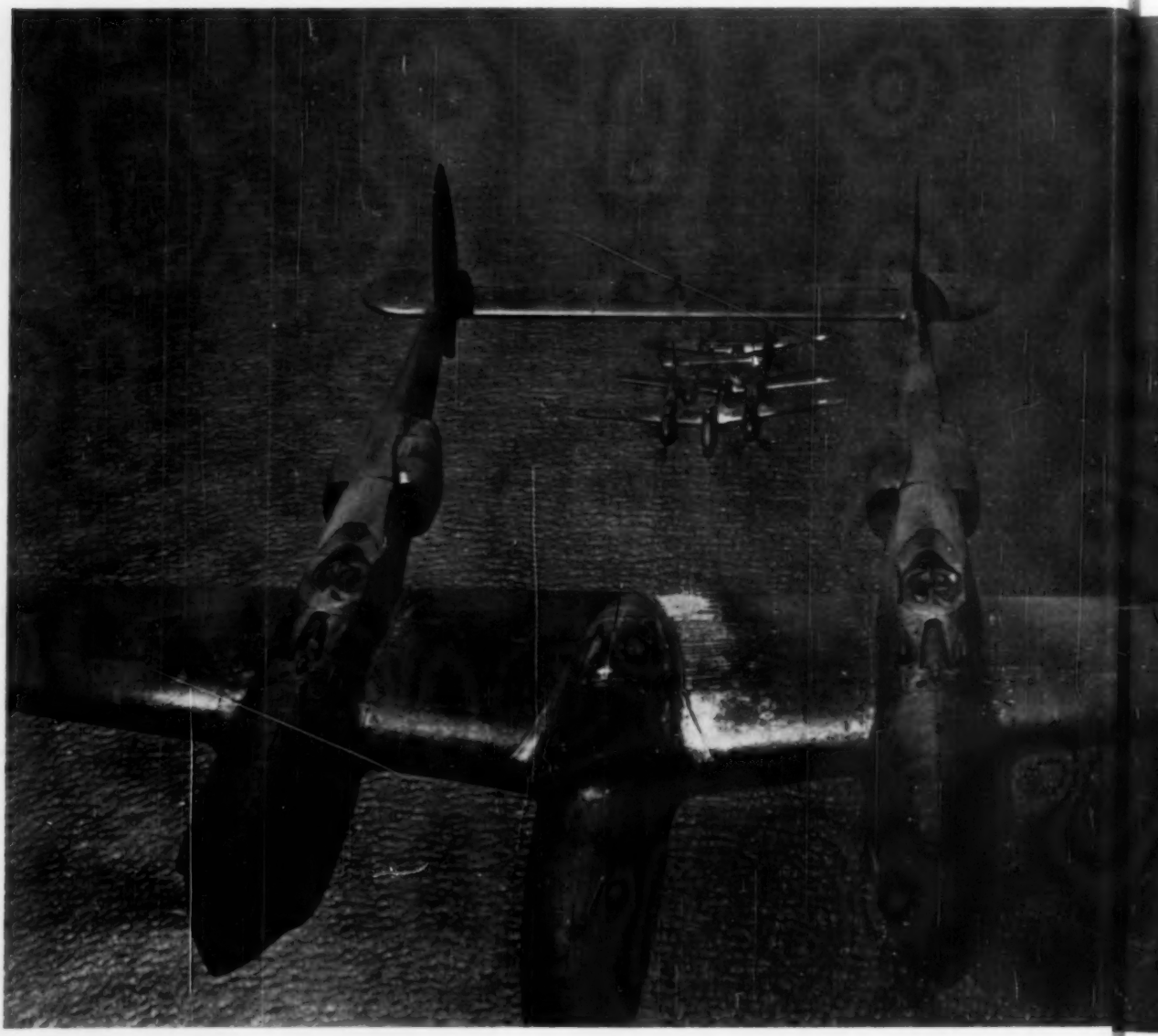
- Early versions of the X-15 will have a top speed potential in the Mach 5-7 range between 3,200 and 4,500 mph.
- These same models are intended for peak altitudes in the vicinity of 200 miles. This is well above the perigee, or low point, of the earth satellites' elliptical orbits.
- In the course of a "normal" high-performance flight, the X-15 is expected to follow a ballistic path skyward and toward the earth again, during which conditions of weightlessness as long as five minutes will be experienced by the pilot.

Each of these statistics represents not merely an advance over currently established records, but marks a completely new order of magnitude for each.

Not surprisingly, this new level of performance calls for multiple technical breakthroughs outside the obvious area of raw power. Here are just a few:

Aerodynamics: Huge bulges run along four-fifths of the fuselage, supporting the stub wings at the apex of their triangular cross-section; further aft, they carry the aircraft's trapezoidal elevator surfaces, each of them set at 15 degrees negative dihedral. The idea behind these ungainly protuberances is to minimize wing/fuselage interference drag, a real trouble maker in the X-15's speed range. Wings and control surfaces trade on X-2 experience, and feature blunt or "flat plate" trailing edges to a much more pronounced degree than the (*Continued on page* 58)

Right: Artist's conception of the X-15 on a Navaho type booster.



LOCKHEED'S

By
RUTH and
DON DOWNIE

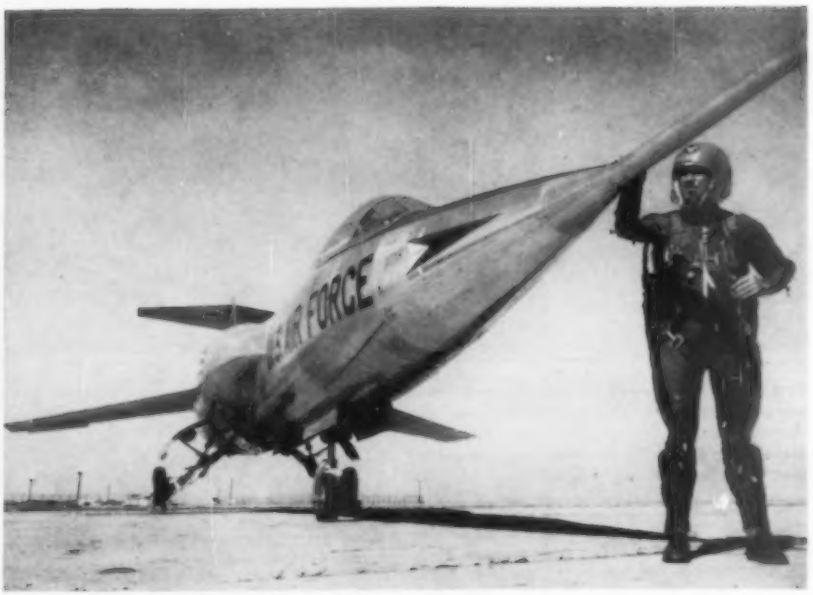
Erik Miller, famed for catching the "Personalities" of Lockheed's airplanes with his Nikon, his favorite camera, and some of his work used on FLYING's covers.

FOR 17 YEARS, Erik Miller has been portraying the character of Lockheed's products by photography.

Every new airplane has a personality for Erik. Military planes tell their best story against angry skies. Transports usually are photographed against a cloudless blue or cruising serenely above the weather. Beyond that, there are no rules to Miller's aircraft portraiture except his artistic "feel" for a good picture coupled with techniques for planned effects available with the camera's lens.

The Lockheed photograph reproduced more than any other aviation picture is the P-38 formation framed in a tail boom. Miller was inspired by a painting for an advertisement which utilized the famous twin booms as a frame. He made the picture while on an assignment to shoot a story of the first group of non-commissioned pilots

Left: One of Miller's most famous photos is this Lockheed formation framed in a tail boom. It took nearly 30 minutes to set up this picture because the formation was so critical.



Above: An extremely wide angle lens was used to make the tiny F-104A fighter look even smaller beside H. D. "Fish" Salmon, Lockheed's engineering test pilot.

Left: A former "Hump" pilot from China maneuvered the nose of this "Connie" to less than eight feet from the open tail of a Martin B-26 where Miller sat with his camera to catch this wide-angle shot.

Below: Miller made this striking night photo of the X-17 re-entry missile clearing the launching ramp at Patrick AFB, Fla., from 500 yards away by using a 35 mm Exacta with a 420 mm telephoto lens.

LENSMAN

in the Air Force during World War II. The sergeant pilots were stationed at nearby Los Angeles Airport where Miller spent the better part of a week photographing their activities.

"I discussed this tail-boom photo idea with four of the boys and we arranged to meet off the California coast the following day," said Miller. "I used a Hudson bomber for a camera plane, with Lockheed pilot 'Nick' Nicholson at the controls.

"I talked the P-38's into correct position with two-way radio. It took us nearly 30 minutes to achieve the setup because the formation was so critical. I had the lead plane move in slowly, at six-inch increments, with the other planes 600 to 800 feet below and behind. Finally the back-lighted photograph looked good and I made 12 exposures with an old 5x7 Fairchild F-8 camera through the tiny

First flight of the F-104B (two-place) was taken with a 4x5 Graphic at 1/250th second, showing necessity to sweep camera with plane moving at about 200 knots. Background is blurred, actually adding to the photo.

1x2-foot hole in the belly gunner's compartment."

The pictures, both black and white and in color, ran in magazines all over the world. Even today Lockheed gets requests for prints from former P-38 pilots and writers.

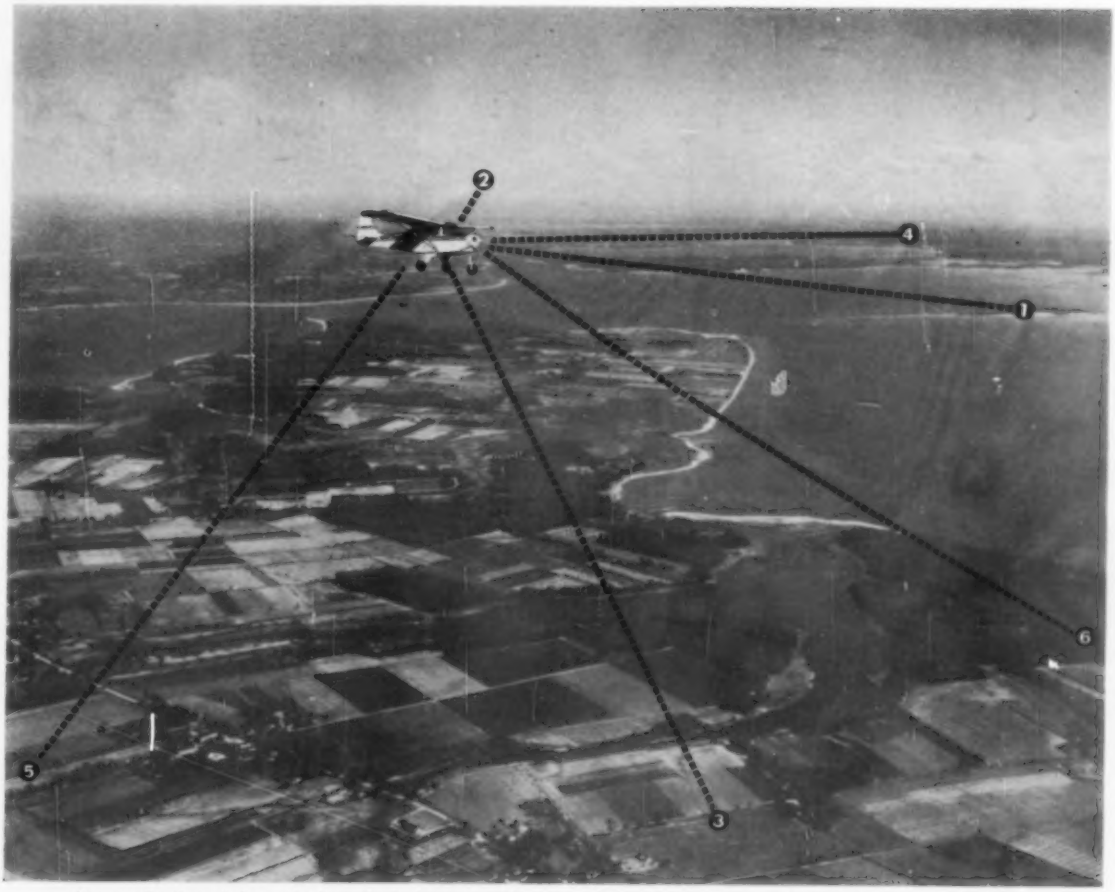
In the lobby of Lockheed's new $9,000,000 Engineering Flight Test Center at Burbank, there are some unusual evidences of Miller's photographic genius. In such a building, one might expect to see massive enlargements of latest aircraft or missiles—but not so.

"Any aircraft photo we could show would be obsolete before we hung it up," said Miller. "Designer Jack Davis and I conceived a series of photographic abstracts. I shot extreme close-ups of tiny strain gages, rotary step switches and miniature electronic parts. Sections of the negatives were enlarged to 18x22 inches, and mounted on low-angle photos of the F-104 tell the story of "the missile with the man in it." In the F-104 photo, Lockheed's Chief Engineering Test Pilot, H. D. "Fish" Salmon, leaned with his hand against the air speed boom while Miller made the picture with an extremely wide angle lens to make the tiny fighter to look even smaller in the background. Using the same technique, he makes a long assembly line look longer or an in-flight aircraft appear much farther from the ground.

The narrowest escape from trouble Miller remembers was on a routine assignment during World War II when Maj. Barry Goldwater (now U. S. Senator from Arizona) asked him to shoot a series of map photos of the Mono Lake area for a possible gunnery range. As Miller tells it, "I went out with an Air Force pilot in a Martin B-26. We turned east over Bakersfield and headed over the High Sierras toward Mono Lake. By the time the pilot discovered his high blower wouldn't deliver needed power, we were so far down in a narrow canyon we couldn't make a 180-degree turn. All we could do was stall up the canyon, just clearing the boulders and finally stagger across a saddle of the ridge. One instant we were as good as goners; the next were 7,000 feet above the valley floor!"

The roughest trip Miller ever logged was with Hollywood pilot Paul Mantz in the Cinerama B-25. The assignment was to accompany two magazine photographers and one newsreel man to shoot a new TWA Constellation over the Grand Canyon. The flight took off late, thunderheads making it extremely turbulent. The canyon itself was a huge cauldron of vertical currents and both planes were required to fly inside it, in formation. Even with more-than-adequate ventilation from open waist-gun and tail-turret windows, the lensmen were sick for the entire three-and-a-half-hour flight. Not a single foot of motion picture footage was exposed be- (*Continued on page 74*)

Slow shutter speed and golfer's "follow through" helped to pull plane out from blurred background during this Constellation take-off. Catching the plane just inches off the runway illustrates "airborne effect" which advertisers prefer.



One application of the author's method of scanning the area while in flight. Numbers indicate sequence of glances.

A doctor who is a pilot explains a method of scanning the sky while in flight, which he has developed.

Let there be sight

By J. T. FLYNN, M.D.

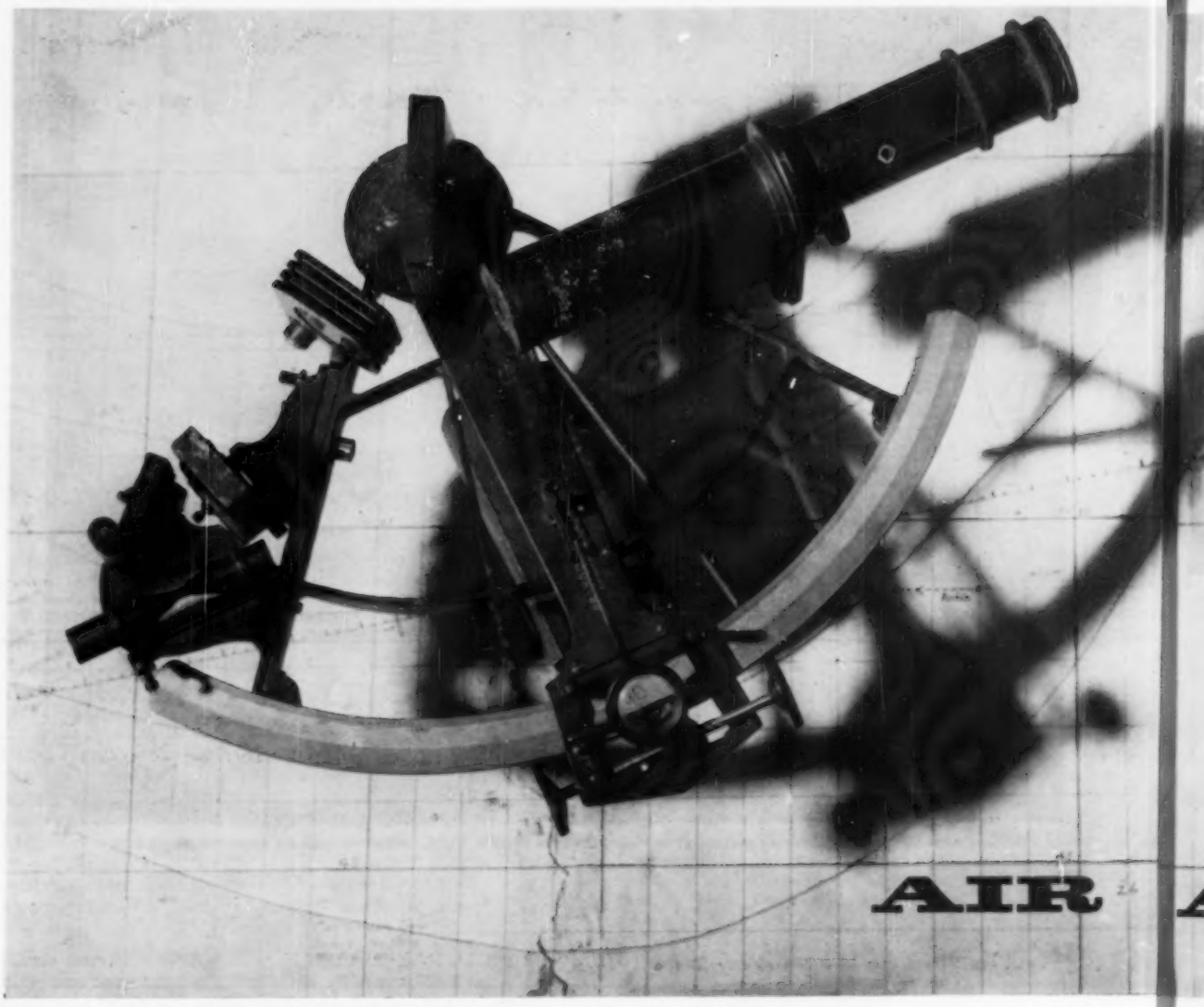
Doctor Flynn is past vice-president of the Flying Physicians Association and is currently active in its aviation medical advisory activities. A private pilot since 1954, he flies out of Teterboro Airport, where the Tri-Pacer of which he is part owner is based.

THE DAY IS CLEAR, with widely scattered clouds at 4,000, visibility ten miles. The light wind and early morning sun have not dispelled the slight haze from the wintry New Jersey ridges. On your first solo check-out of the Tri-Pacer's omni, you crossed exactly over the Caldwell Station and, ten minutes later, exactly over the Stillwater Station. A 180 brought you around to the 120-degree heading back to Caldwell—the Lycoming was purring like a kitten, a beautiful day, with solid air, no vertical drafts.

Suddenly, a clean, shiny twin-Cessna cut directly across your path, 75 yards dead ahead and faded swiftly away to the southeast, toward Newark, a tiny horizontal shadow in the morning sun.

Sudden sweat on the forehead and hands is colder in winter and chills you longer. Don't glue your eye on that ship! It's gone and can't do you any harm now. Look around! Be sure no one else is bearing down on you. There doesn't seem to be anything else in the sky but you were scanning it, so you thought, a few minutes ago, too. Neither you nor the twin saw each other. With his low wing and your high wing, the two of you were matching blind spots. But you should have spotted him farther away. Were you hidden from him in the sun's glare? Perhaps, but you can still see him toward Newark, toward the morning sun.

Probably neither he nor you have been using your eyes properly. Well, what is the best (*Continued on page* 86)



Marine-type sextant used by Lt. Arthur Whitten Brown to navigate the Vickers Vimy bomber across the Atlantic.

AS HE LOOKED at the young man with the cheerful, ruddy face and tousled hair, an expression of utter disbelief crept into the insurance chief's face. "Repeat that again, Captain Alcock. You want what?"

John Alcock smiled. "I want to insure my life for 20,000 pounds. There is always a chance that Brown and I may not return from our flight and I want to ensure that my wife is taken care of in that event. I want a straight life policy for 10,000 pounds with double indemnity in case of accidental death," Alcock explained carefully.

"Right," the agent snapped, "you can have it under one stipulation: you will not be allowed to fly, least of all to pursue this crazy plan you and Brown have of flying the Atlantic. You must be addled."

"It can be done and it will be done," Alcock said wearily and rose. "But I take it you refuse to insure my life?"

"I wouldn't insure you for a penny."

A few minutes later Alcock sat facing another insurance man. He outlined his requirements and Jim Bailey sat for a few moments deep in thought, then pressed a buzzer on his desk. A young woman entered. Without looking up, Bailey said, "Miss Scott, bring me an insurance schedule A, high risk rate."

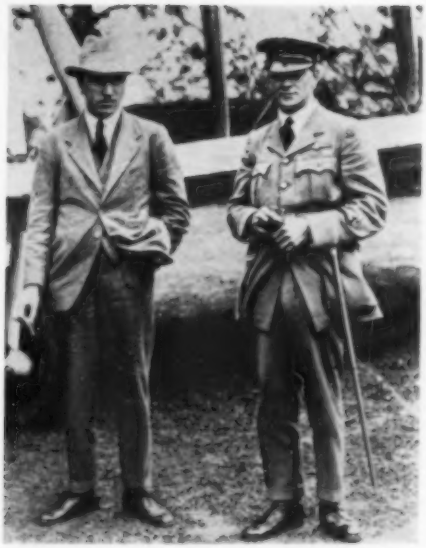
Bailey flicked the pages and began to fill in the form. John Alcock, born in Manchester, 1892, Royal Aero Club flying certificate at age 19, military bomber pilot, captured after forced landing in Germany, prisoner of war. Amount of insurance: 10,000 pounds sterling with double indemnity in case of accidental death.

Only after the form was completed did he look up. "You are pretty certain you and Brown will pull this off, aren't you, Alcock? I've got a 50-pound bet on you."

"Make it 1,000," Alcock smiled. "I don't think you'll lose."

"I hope to heaven not; otherwise I'll be kicked out of my job for taking this policy. I know it's unprecedented but I believe you will succeed."

A minute after Alcock left the office, Bailey lifted the telephone and called a number. "Fred? Look, that bet on Alcock's flight; care to make it for 100 pounds? What? 500? Okay, you're on. Five hundred pounds says Alcock and Brown will fly the Atlantic non stop."



Capt. John Alcock and Lt. Arthur Whitten Brown (in uniform) were the first to span the Atlantic by air.

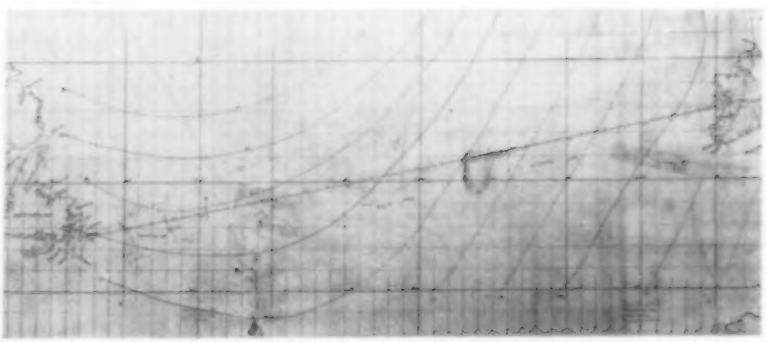
AGE KNIGHTS

Fraught with danger, the first non-stop transatlantic flight proved to be one of the greatest adventures of early aviation.

By BILL WHARTON

The final obstacle in his way to the first aerial spanning of the Atlantic was cleared when John Alcock, 27, left the insurance company. He felt his chances of success were better than even, but did not want to leave a widow penniless. Now, the greatest adventure of early aviation was underway.

Alcock's epic of the North Atlantic was no haphazard invitation to danger; it was a meticulously planned adventure not the least problem of which was finding the best available navigator. When he began to look around for this man, he found Arthur Whitten Brown, a wartime navigator who had been wounded and repatriated by the Germans. From his boyhood, the taciturn Brown had shown a love of navigation. He seemed to have an instinct for it.



The chart used by Brown shows course followed by the Vimy from Newfoundland to Ireland.

"I plan to make a nonstop flight from Newfoundland to Ireland," Alcock told Brown after the two had been introduced in Glasgow where Brown was born and lived in this year of 1918.

"I think," Alcock continued, "I can talk the Air Ministry into lending me a Vickers Vimy bomber which we can convert for a flight of about 2,500 miles. What do you say?"

(*Continued on page* 80)

tourists in the Arctic

Midnight sun that refuses to set during June and July at Kotzebue, Alaska.

Above: Hundreds of small, milk-white Beluga whales are taken in summer along Alaska's coast. Eskimos find them choice eating.

IT'S NO POGO STICK jump to Alaska from anywhere in the states and a tourist who doesn't see plenty of it while he's there has missed a big reward. On the other hand, Alaska isn't Europe where you can go wandering around without a guiding hand. If you want to see the real Alaska, somebody who knows it has to take you by the hand—both hands in fact. Wien Alaska Airlines, a sourdough outfit if there ever was one, is set up to show you the works—transportation, hotels, food, entertainment et al.—all-expense touring just like in the Old World.

A three-day Arctic Coast tour from Fairbanks, including Nome and Kotzebue, sets you back $155.50. The same gets you to Point Barrow for a like period; or you can do a two-day tour of the Yukon Valley for $62. On any one of the three tours, you'll see sights unduplicated anywhere on earth. Of course, Fairbanks and Anchorage are something in themselves, to say nothing of Juneau, but the Eskimos live north of the Circle and you must meet those grand people. And there are other things you ought to do—take a dog team ride, buy "ivory" from the King Islanders, watch the pack-ice heave, see the boats come in with their catches from the floes, toss pebbles into the Yukon, catch a few Shee-fish, maybe meet a brown bear under proper chaperonage (yours, not his). And not the least of your rewards will be the Arctic Circle Certificate the crew of your plane will give you. In Alaska, don't miss Alaska! END

Semi-domesticated reindeer, first cousin to the caribou, thrive on tundra.

Alice Ahmaogah, chosen "Miss Top of the World" in the first contest to select a queen for the farthest north community on the North American continent. Dorcas Brower (center) ran a close second and Molly Ahvakana (right) was third. Winner received all-expense tour to Victoria, B. C.

Wien tourists head for the Arctic in parkas supplied by airline.

Memorial to Will Rogers and Wiley Post near the spot where they met death when their plane crashed during a water take-off at Point Barrow, Alaska.

Visitor at Fort Yukon photographs Huskies staked out till winter.

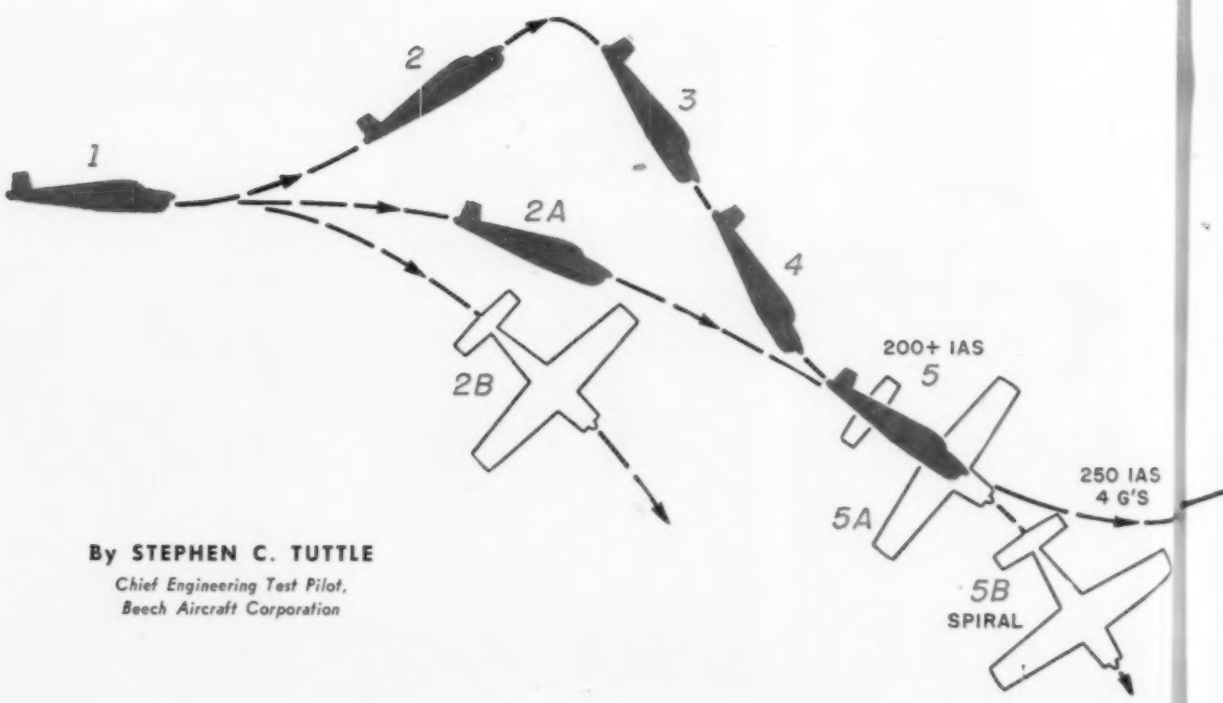
THE PRO'S NEST

THE INEXPERIENCED INSTRUMENT PILOT AND WEATHER ACCIDENTS

A veteran of thirty years' flight experience

TROUBLE POPS UP WHEN unqualified pilots attempt to fly instrument weather with clean, high-performing airplanes. There is only one answer to this situation—either learn how to fly weather or stay completely out of it. Learning a little about instruments and meteorology is not sensible or practical for the pilot who will be flying bad weather. One who has been given a little instrument time may be able to make a 180-degree turn and get out of trouble. Another, with a little more experience, may be able to keep an airplane under control in smooth air for a short time; and another, with still a little more savvy, may be able to control an airplane briefly in rough air; but nothing short of the minimum experience required for a CAA Instrument Rating will qualify any pilot to fly ordinary instrument weather, orient himself, and make an ordinary instrument let-down. There are no exceptions!

Most manufacturers try to build a good, safe airplane and still have one that is practical. This is easier said than done. Requirements for single-engine, commercial airplanes seem generally to call for a 4-5-place vehicle, 100 pounds baggage, some 1,000 miles range, approximately 175 to 200 mph cruising, small airport adaptability, capability for night and instrument flying, gross weight under 3,000 pounds, less than a 250-hp engine, and ease in flying. These requirements add up to a small, clean airplane with a high-speed wing, but one which still can provide a very high angle-of-attack for short field work. This airplane should have retractable gear, and constant-speed propeller. To make it most useful, it is necessary to spread the C.G. to its maximum; and, since we are thinking of 200-mph speeds, it must stand 8-G loads. To come up with



By STEPHEN C. TUTTLE

Chief Engineering Test Pilot, Beech Aircraft Corporation

discusses problems which beset the novice pilot on instruments.

such an airplane requires high skill in design, extensive engineering and exhaustive flight testing. It is a major economic project.

Who will buy it and fly it? What are the flight requirements? Just how are they determined? It is easy for any professional pilot to evaluate an airplane by CAA or USAF standards. It is far from easy for all private pilots.

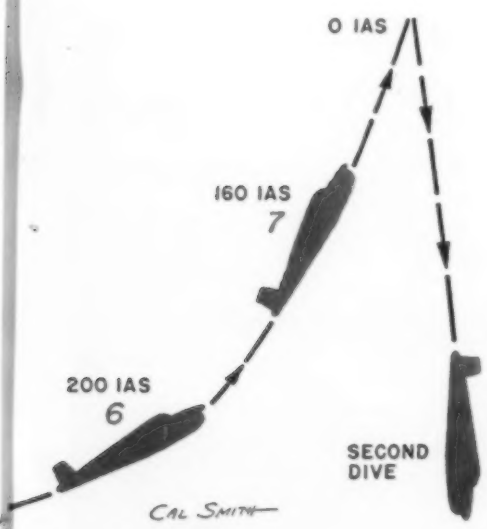
Many owners of a $20,000-class airplane who do their own flying are middle-aged or past, and have been too busy making enough money to afford such an airplane to spare time to acquire professional skill. Anyone qualified to evaluate an airplane for these pilots must have worked with many of them in training and check-outs—grasped their problems, understood their needs and limitations. Only such could know where and when they are likely to exhaust their skill—where the airplane itself takes over the flying. Only someone who has given thousands of hours of instrument training can wholly visualize the cockpit confusion when a novice suddenly loses visual contact and attempts to fly by instruments.

People of limited experience are sometimes prone to blame certain accidents on poor aircraft stability and light stick forces. Much has been said and written about spiral stability. But most of it is beside the point. Good stability in airplane design will not protect the novice in untoward emergency. Frequently, we have the same story. Someone reports hearing an airplane maneuvering in a low overcast; seconds later pieces float down or the airplane dives out and comes apart in a sharp pull-up. These are mysteries to the inexperienced pilot and the public, but not to the airwise. He has warned the non-instrument pilots many times that this would happen if they attempted to fly weather without proper training and aids. But, unhappily, he knows many will try, lured into the effort by someone or another siren of compromise.

A practical airplane cannot be manufactured to wholly protect the inexperienced. Such a plane would require the capability to withstand high-speed stalls at terminal velocity. Even this would be no protection to those who dive out of an overcast so low that they cannot recover. Good all around stability, including spiral stability, would help under some conditions but would be of no help under others, and actually be detrimental in certain circumstances. This applies, of course, only to practical, clean, high-performing airplanes, the type that is creating a problem for inexperienced operators.

Such airplanes are the first to have speed and range enough to make weather over the horizon a serious problem. Also, they are the first to be designed with comfort, visibility, quietness, and ease of flying to the point of inducing overconfidence in the inexperienced. So, pilots of lesser skill make more long flights than formerly were attempted by their predecessors.

If a few facts be taken into consideration, the airplanes in question will not be criticized or condemned so readily. The most inexperienced pilots are not having trouble structurally or otherwise in VFR weather. This, in itself, should prove the quality of the airplane. No one would say that an inexperienced pilot would have been better off in severe weather, if flying (*Continued on page* 68)



Any of the maneuvers pictured at the left and on the opposite page could happen to a novice pilot in the first ten seconds on instruments: Trimmed for cruise (1), if the nose is pulled up and held until airspeed is greatly reduced, plane will become nose heavy (2). If controls are released, the nose will drop (3) until trim speed is reached, regardless of attitude which could result in a very steep dive (4). As soon as trim speed is passed, the nose will start to rise (5) but, if the nose is very low when trim speed is passed, velocity will continue increasing until the nose is well up. Speed starts decreasing as the nose starts up (6) and the nose will continue to rise (7) until 160 IAS is passed. If dive were steep, plane could easily be going straight up when speed is reduced to trim. If such is the case, the next dive or cycle will surely be straight down and the next climb more severe. If the nose should be pushed down (2A) and released (5), results would be the same. If the plane were banked steeply without corrective action (2B), an immediate spiral would result. Should the plane be banked or rolled as in (5A), a high-speed spiral (5B) would result immediately and, even though the nose will try to come up due to the steep bank, it will cause the plane to turn or spiral and, if very steep, the nose will never rise high enough to allow the speed to reduce.

By ALEX DAWYDOFF

If you require fast transportation to inaccessible places or locations which are unsuitable for landplanes, consider

The McKinnon Goose

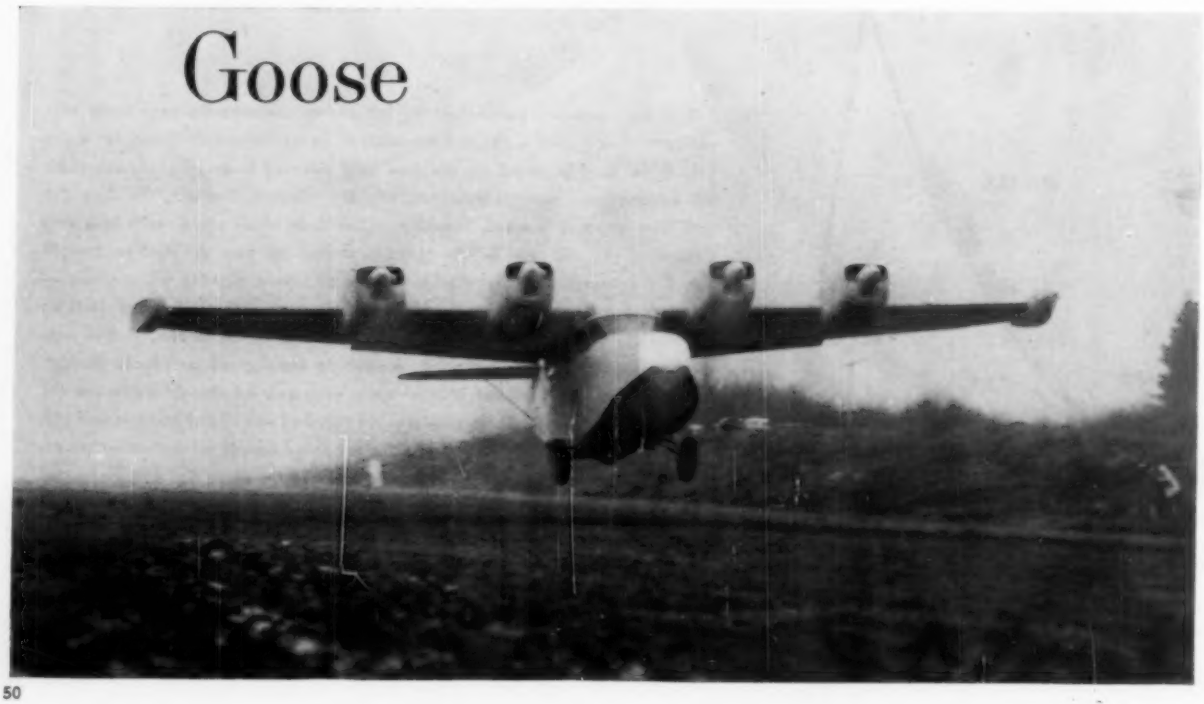
ONE USUALLY ASSOCIATES a four-engined amphibian or flying boat with the huge, erstwhile Boeing 314 Clipper or Navy patrol planes and it is, therefore, rather difficult to visualize an airplane the comparatively small size of the Grumman Goose mounting four engines.

Such an aircraft is the McKinnon Goose, manufactured by McKinnon Enterprises, Sandy, Ore., 25 miles southeast of Portland. The airplane is actually a highly modified Grumman G-21A Goose, originally powered by two Pratt & Whitney, radial engines of 400 hp each. The McKinnon version has four supercharged, flat-six Lycomings, rated at 340 hp each and equipped with three-bladed Hartzell constant speed, full-feathering, reversible propellers. Advertised performance indicates a rate of climb of 2,500 feet per minute, take-off at a gross weight of 11,000 lbs. in a distance of 600 feet at 50 mph IAS, cruising speed of 225 mph at 10,000 feet on 65 per cent power, and landing speed of 60 mph true.

This remarkable performance was achieved not through the additional power alone, but by careful re-engineering and remanufacture of the Grumman Goose which involved, among other things, lengthening the wing span by adding 16 inches to each tip, installing retractable wing floats which act as tip-plates when retracted, the addition of a dorsal fin for directional stability, and extending the bow by 15 inches. The fuel capacity was also increased from the original 220 gallons to a total of 450 which gave the plane a range of 1,500 miles.

McKinnon Enterprises is no newcomer to the field of amphibian conversion; for five years it has been converting Grumman Widgeons to Super Widgeons by installing 270-hp Lycoming engines. This modification proved so popular that 76 Super Widgeons are presently in operation.

In the four-engine Goose, McKinnon foresees an advanced type of executive transport which, because of its broad range of performance and capabilities, is especially suitable for the businessman who requires fast transportation to locations that are inaccessible or hard to reach by landplane. END



NO. 219

I LEARNED ABOUT FLYING FROM THAT!

Failure to recognize bad flying weather almost proved fatal for this inexperienced pilot and his passengers.

By GORDON BAXTER, JR.

ON A NOVEMBER MORNING in 1956, while flying a new Tri-Pacer with three passengers on board, I began an instrument let-down at a point near the Eagle Lake, Tex., Omni Range. It was a perfectly normal instrument descent. The airplane, rented from Piper dealer Gerald Ashley of Beaumont, Tex., had Omni and a full panel. We were in a 100-mph glide with reduced power and the opaque cloud layer was streaming evenly over the windshield. Everything normal except for two minor items: I was filed on VFR, and I was a private pilot with only 49 hours who had never been on instruments before.

The Tri-Pacer glided down, muttering contentedly in the muffled air. My passengers, in the back on their first trip in a private plane, were marveling at the beauty of the cottony world around us, while my wife, sitting beside me, watched me out of the corner of her eye. Overhead, the speaker droned this same chant: "dit, dit dah dit dit, dit dah. Eagle Lake Omni." I was trying to remember what it was that Colonel Duckworth had said about instruments and me. Was it to keep the needle centered at all times and watch your airspeed? Or did he say something about the ball-bank indicator?

Still the white mists floated by. Slowly the altimeter unwound. Steadily the voice droned out of the speaker, "Eagle Lake Omni." One thousand feet, 900, what is the ground elevation here? About 200, I think. You think? Where do you think the bottom of this cloud is? You'd better think of something definite pretty soon. How did I get into this mess in the first place? Let me tell you.

For two weeks we had looked forward and planned this big cross-country from Beaumont to San Antonio, Tex. Last week end the weather was fairly good, but a warm front was moving in. So we stayed on the ground, and now, on Sunday, the front with all its fog and rain, was moving out. I haunted the weather bureau Saturday night and Sunday morning. At last they told me it would be marginal VFR weather all the way, Houston was reporting minimum VFR conditions, and though San Antonio was still closed, it was lifting fast and should be open about an hour before we got there. We decided to go.

As we flew over Houston, about 45 minutes out of Beaumont, the regular report from Houston Radio gave San Antonio enough ceiling for VFR, with scattered showers. The weather was still marginal but seemed to be improving. I made an enroute report to Houston Radio.

Fifteen miles out of Beaumont I found a big fat rain cloud that hung down out of the ceiling right on my course. So I set up a 100-mph glide and scooted under. It was lower than I thought and I found myself scraping along over the Winnie oil Derricks at about 500 feet. The cloud was only a few miles wide, beyond it we climbed back to 1,500 feet and even enjoyed a little sunshine now and then. Therefore, when low, gathering clouds blocked my course once more near Eagle Lake I applied the same logic and the same glide angle to go under. Up until then my weather experience had consisted of dealing with only one cloud. My second experience was with a backed up warm front that had stopped.

I am sure that an experienced pilot would have recognized the weather I was flying into and turned around. I called it a stopped warm front, but actually I still do not know what kind of weather it was. Officially it was VFR, but on that day I learned there might be some difference between the latest official weather and the sure-nuff flying weather. I don't know how true this is over the rest of the country, but it is very often the case here, along the thunderstorm belt of the Texas coastal plains, where many weather stations are over 100 (*Continued on page* 54)

The Paper Jet

(Continued from page 31)

discontinuity, the stronger the jet. This frontal zone has been called the "Zone of Maximum Concentration of Temperature."

Temperature contrast brings about a strong pressure gradient that causes acceleration in the warmer, lighter air adjacent to and usually south of the "Zone," similar to a Venturi effect. Maximum intensity is toward the northern edge of the stream, tapering off towards the south. The contours are compressed towards the northern edge and, consequently, here will be found winds of greatest velocity. Sought after by eastbound flights, the stream will be avoided by planes flying westbound.

Unfortunately, the Jet Stream has few visible meteorological features. It must be identified by instrument measurements of winds and temperatures, although sometimes its presence can be detected by a layer of cirrus clouds characteristic of the phenomenon.

Because the stream is compressed on the north side, a shear effect takes place. This can result in severe turbulence. Pilots flying the Jet Stream report a peculiar "cobblestone" effect when nearing the north edge of the stream. This may be compared with the feeling of driving a car from a smooth pavement suddenly onto a cobblestone road. It is often an indication of even more severe turbulence to come. Once inside the stream, it will be smooth sailing but, until more is known, great care must be taken to "fasten seat belts."

Long Range Operation

Operating characteristics of the turbojet make mandatory maximum efficiency cruise-techniques. In theory, the most efficient flight path is a slow climb throughout the entire flight—50 to 60 feet per minute. Aside from other difficulties, this would pose a problem to Traffic Control. Analysis has shown that the optimum flight path can be approximated, with a small loss in fuel consumption, by using a step-climb procedure. For this the plane climbs to 30,000 feet initially, remains there a few hours, then climbs to 35,000 for the next hour or so and finally finishes the flight at 40,000 feet. Eastbound flights, because of helping winds, can climb directly to 40,000 feet. Most Clipper X flights thus far have been operating on this principle.

Loading

For most of us, accustomed to conventional aircraft, the data on speeds, fuel burned, weights and loads is startling.

The maximum gross weight of the airplane is 295,000 pounds; the landing weight but 195,000. Thus, 100,000 pounds of fuel must be burned off during flight, if the plane departs with full gross weight. Fuel used is JP-4, weighing 6.5 pounds per gallon. Airplanes of the transport type have a certain weight which may not be exceeded on landing. This is a design structural factor. The stress imposed on landing with full gross weight would be too great for the structure to bear.

For flights of short duration, this means that the gross weight at take-off is limited. Due to this limitation, some of the Clipper X's eastbound flights have actually been weight-restricted. Fortunately, in our case, this scarcely affects the useful load but does result in less fuel put aboard. Fuel loads for westbound flights have averaged around 90,000 pounds, equivalent to 13,800 gallons.

It is ironical that the latest types of piston-powered aircraft now in use have as great a fuel reserve as the jets will have little. Instead of thinking in terms of fuel on board, one must regard the jet's fuel reserve in distance that can be covered. Fuel loads are computed on the basis of starting, taxiing, engine check and take-off, fuel burned during flight, holding at destination at an altitude of 1,500 feet for 30 minutes, then the climb to 30,000 feet and flight to an alternate airport.

This is a small reserve and normally the plane will not descend till it is certain it can land without delay.

Flight Plans

The diagram shows a typical prognostic planning chart for September 21, 1957, based on 300 millibars or 30,000 feet. The intersection of the Fronts with the 300-millibar levels are also indicated. These form an important part of high-level analysis and represent the most advanced technique in Jet Stream location.

Least-Time-Tracks of both eastbound and westbound flight are in solid black lines on chart.

New York-London Boeing 707-321 Flight 1,000, 21/9/57

FLIGHT TIME	6:04 hours
DISTANCE	3210 N.M.
TAKE-OFF GROSS WEIGHT	287,000 lbs.
FUEL	107,000 lbs.
CRUISE	Maximum Thrust
ALTITUDE	30,000 feet
AVERAGE TRUE AIR SPEED	488 Knots
AVERAGE GROUND SPEED	526 Knots
WIND COMPONENT	plus 38 Knots

The track of the westbound flight on August 18, 1957 (in dotted line) demonstrates clearly the great variation in tracks in Least-Time routing.

When Clipper 1,001 nears London Airport, the dispatcher on duty calls Air Traffic Control to check if any delay might be expected. When a delay of over ten minutes is possible, the captain of the jet is advised to remain over a holding fix at 30,000 feet. When final approach clearance is obtained, the jet descends directly from that altitude for landing.

Inspection of typical flight plans reveals some interesting features. Speed while descending is much slower than climb speed, exactly the opposite of what one might expect. Climb speeds are high because the greater the speed the more economically the plane operates. In other words, more miles per gallon are made good. Dive brakes hold descent speed low to keep it from building up. This avoids undue stresses when entering turbulent air in the lower atmosphere. Clipper X climbs to 40,000 feet in 16 minutes at over 400 knots airspeed; while descent from that altitude requires ten minutes longer at 330 knots.

Diversions to alternate airports due to weather or traffic congestion have been few, even during winter months. Using minimum landing conditions in vogue today, the highest number of diversions, (4), occurred in March. February had but two diversions. During the other months none occurred. Highest wind component observed was 200 knots. Average forecast error was small, well within allowable limits.

Time to Change?

The other day, while reporting in for my "Round-the-World" Flight No. 10, I arrived at London dispatch center just as Clipper 1,000 was due to arrive from New York. I found the dispatcher assigned to the jet flight calling Air Traffic Control for descent and landing clearance for Flight 1,000. Less than 20 minutes from the time I entered the office, Clipper X descended from 30,000 feet and sat down at London.

"That is a load off my mind," smilingly said my friend, lighting a cigarette, "I can now relax until tomorrow morning. You know—I used to smoke cigars during my watch, but with these jets and all, I find myself smoking more and more cigarettes. They are faster."

"I wonder if I shouldn't switch to cigarettes, too?" I thought, pensively shaking the ashes from my pipe. END

NEXT MONTH IN FLYING

The Soviet Pilot Is Quite A Fellow

More than in any other country, the Soviet Air Force pilot has been preselected and molded to the abilities that give him the right to wear his uniform. He is honored, respected, highly trained and highly paid.

•

Check Pilot Report On The Cessna 175

Check pilot author Norman Jacobshagen analyzes the latest addition to the Cessna line, and its 175-hp, geared Continental.

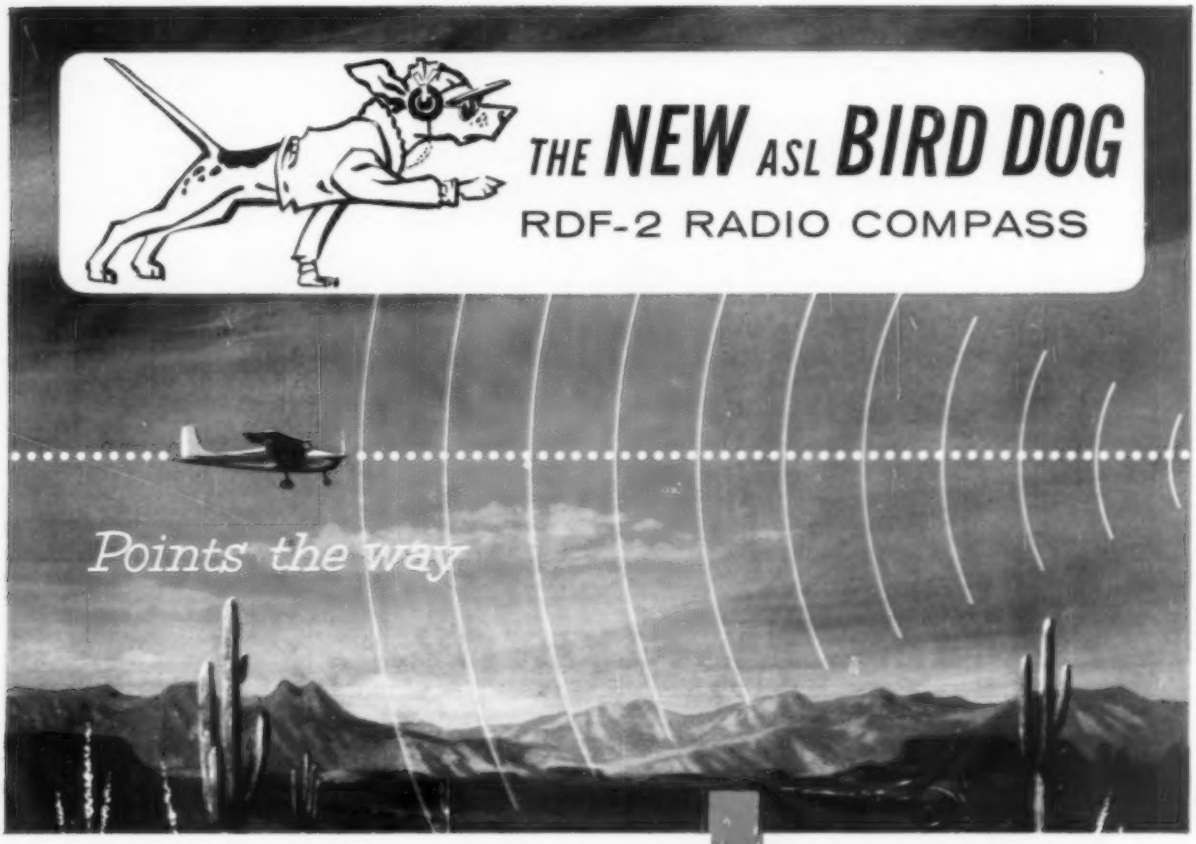
•

Threshold of Space Part II

Continuing our look into the exploration of space within the next five years, from manned satelloids to the first dipping of man's toe into the cold vacuum of outer space—by proxy.

THE NEW ASL BIRD DOG

RDF-2 RADIO COMPASS



CHAMPION POINTER IN THE "HOMING" FIELD ... the new Bird Dog points the way to your destination, sure, safe, simple.

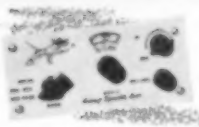
NOW YOU CAN GET MORE FUN OUT OF FLYING... fly on course relaxed, assured, secure. Listen to music, news, sports and weather reports while the Bird Dog homes you directly in on your selected station.

EASY TO USE... tune the Bird Dog like an ordinary radio. Select any standard broadcast station or low frequency range station located at your destination. Turn toward needle until centered. You are now on course.

TOTAL WEIGHT OF INSTALLATION: Less than 10 lbs. **495.00,** complete with loop. See your BIRD DOG distributor or write to AIRCRAFT SPECIALTY LINES today!

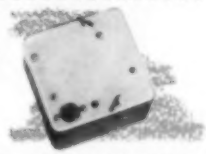
SEND NOW FOR FREE BROCHURE! Write today for complete information. Illustrated color brochure will be rushed to you by return mail.

BIRD DOG RDF-2 TUNER
Weight: 5.0 lbs.



BIRD DOG FERRITE LOOP
Negligible drag
Weight: less than 4 tenths lb.

BIRD DOG POWER SUPPLY
Rugged and compact
Weight: 3.47 lbs.



BIRD DOG LEFT-RIGHT NEEDLE INDICATOR
Fits standard 2¼" instrument hole.
Weight: 3 tenths lb.

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SEND FOR FREE BOOKLET

DOYN AIRCRAFT

BOX 3035 SOUTHEAST STATION WICHITA, KANSAS

I Learned About Flying from That!

(Continued from page 51)

miles apart. Houston Radio had been reporting a solid overcast at 8,000 feet and a broken layer at about 1,500 feet. I found all this as advertised for about 45 miles. Then the broken stuff below began to thicken and the time came for me to draw on my No Experience for "The Decision."

Should I try to climb over it? No, I was not anxious to navigate without ground check points. So I looked below again. The little clouds down there were rapidly joining hands. I looked up ahead. A steady ramp of clouds rose from the lower layer and formed a milky horizon, miles ahead. If I stayed put, my sandwich of sky would apparently pinch out. Remembering my past success in outwitting that cloud over Winnie, I decided to go down and see if there was room to scoot under again.

As I was fast approaching a solid cloud layer below, I aimed my descent to take us right under the edge which appeared clear. We passed the wispy overhang of the thickening cloud, had a moment of clear air, and then popped right into the soup. For a moment, all I could do was to sit there paralyzed. I let the ghostly letdown continue for a few hundred feet, because I still had hopes of coming out of the bottom with a good ceiling. Simultaneously, I was trying to recall the main points of Colonel Duckworth's article in the April '55 issue of FLYING.

As well as I could remember, Duckworth had said to leave power and trim settings alone, not to make a turn while descending or climbing, and concentrate on bank control by watching the turn indicator needle.

We were now down to about 800 feet and still no bottom. I decided to try to climb out. I let the forward pressure off the wheel and applied power to assume level flight. The airspeed built up to about 125 mph and settled down. No bank. No dive. No climb. Good old Piper for putting a cruise notch on the throttle shank. As soon as I was sure we were in level flight, I eased the wheel back till the airspeed dropped off to 100 mph climb. Turn needle straight, eyes roving over the other instruments, although I don't remember seeing them. And I watched the sky. It was lighter up there, and getting lighter all the time. I held it. The speaker droned on, "Eagle Lake Omni, Eagle Lake Omni . . ." but it didn't sound like a funeral chant any more. I could see out now. And suddenly we were out in the air once more with a smokey layer of clouds below and a solid layer of clouds over us, everything bathed in a kind of a silvery light. I let the air out of my chest that I must have been holding for a long time, say about a year. Let the little Piper find its level cruise again, and then, only then, set up a half a needle width turn and let the world go round us half a time. To my passengers, to the Airman's World, to anybody listening in, I said, "What we are doing now is getting out of here and going home."

I reported the weather to Houston Ra-

(Continued on page 56)

"Helicopters are easy to fly"

Here's what fixed wing pilots say about the transition to a Bell

Chief pilots and airfleet supervisors often ask us: When a company buys a Bell, does it also have to "buy" a helicoper pilot? The answer, of course, is *no*. Transition from fixed wing to helicopters will be one of the simplest, most satisfying jumps you've ever made . . even easier than learning to fly your first light plane.

Read what Rod Fraser, President of Aircopter Transport, wrote us recently: "I'd had 3400 hours of fixed wing. I soloed a Bell in 5 hours. It's my opinion that fixed wing pilots have an 'air wiseness' that's a great aid to transition. So much of the stuff is similar. One point that particularly stuck with me is — you can get plenty of power-off landing practice in a helicopter course; far more than in fixed wing forced landing procedures."

Or take Chief Pilot S. M. Maxwell of Burlington Industries. He writes: "I soloed the Bell in 8 hours, 10 minutes. After the prescribed Bell training we had our Commercial Helicopter Rating. Since that time we've used our machine in the mountains, on top of buildings, in front yards of plants, under every imaginable landing configuration (at gross limit), and there hasn't been a minute of mental strain."

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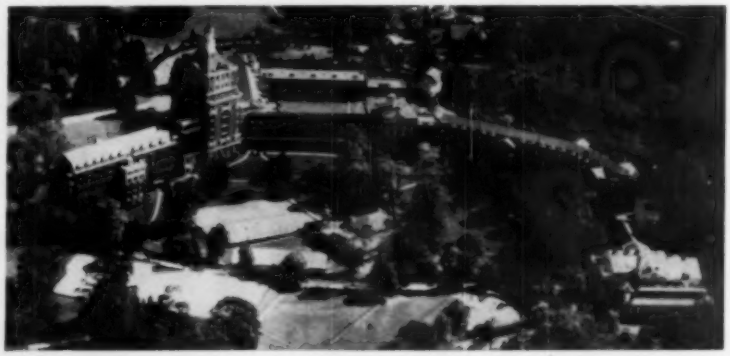

OVERNIGHT STOP NO. 38

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(Continued from page 54)

dio. They asked me if there were any vertical developments, I told them no. They ran my reports with their next weather. I canceled my flight plan, figured my gasoline and told Houston that I was going back to Beaumont. And that was the last Houston and Eagle Lake heard of me that day.

Later, in the cool of the hangar, telling all this to my instructor A. M. Vannaman, I concluded by saying, "Now Van, I told you all this so you could point out any mistakes I might have made . . ."

"Just one," said Van, "Just one. You took off."

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All in all, that makes the Skimmer a "natural" for getting in and out of tight places . . . like small airports and lakes . . . even ponds and bayous.

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With flaps down, you can cut all power and this graceful, easy-to-handle amphibian tends to *hover* like a bird. But whether climbing, cruising or coming in for a landing, you'll be amazed at the Skimmer's big-plane stability.

Once its wheels touch the runway, or its hull brushes the water, the Skimmer amphibian is *in*. All you need to do is to guide it "home" and cut the power.

More Room, More Visibility—Another thing you'll like about the Skimmer is the roomy interior—with the wide seats that give you *extra* shoulder room. You'll like the wider visibility, too, because in the Skimmer you sit forward of the wing. That means you can see up . . . down . . . and almost all the way around.

Construction and Maintenance—One thing you can't see in any airplane is certain construction details. But because this *versatile* amphibian is built for water operations, you can be sure that it's as rugged as they come.

It is also made to take salt spray day in and day out. For every piece of metal in the Skimmer is completely alodined and chromated *before* it reaches the assembly line. This assures you that all "hidden corners" and metal overlaps in the finished plane are protected against corrosion.

As for the engine and propeller, they're mounted above and behind the leading edge of the wing. Thus the Skimmer's wing acts as a shield to protect them from flying spray. Net result: there's no additional engine or propeller maintenance over that of ordinary land planes.

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Threshold of Space

(Continued from page 39)

earlier "X" aircraft. Conducive to stability in the high supersonic regions, they are a full foot in diameter on the vertical stabilizers and rudder. All leading edges, by contrast, are sharp, but without the razor edge of the X-3 or F-104. Reason: knife-edges and needle-noses are particularly vulnerable to friction heat. Another expression of this design philosophy is found in the fact that all corners of all control surfaces are slightly rounded.

Controls: When the X-15 flies within the atmosphere, its altitude and direction is controlled by the usual aileron-rudder-elevator combination—supersonic style. All movable tail surfaces are of the "all-flying" variety. There are no fixed stabilizer surfaces faired into the control planes. This includes top part of the rudder, an unusual configuration in this country. The bottom serves as stabilizer, and the top half turns, Boeing Bomarc fashion, to act as yaw control. Slung underneath the fuselage is a fixed fin about two-thirds the size of the dorsal stabilizer it resembles. Jettisoned before landings, it is designed to give additional stability at medium-high altitudes when the wing wake tends to blank out some of the effectiveness of the dorsal stabilizer, particularly under high angles of attack. The alternative would have called for a towering dorsal tail fin, not a desirable feature in an aircraft designed to be carried aloft in the bomb bay of another plane.

No matter how sophisticated the airfoil, however, its effectiveness dwindles and disappears at altitudes above 140,000 feet. How then can our space pioneer be controlled as it approaches the top of its elliptical trajectory, some 200 miles up? Rocket reaction controls are the answer. Above a preset altitude, conventional stick and rudder motions by the pilot activate small reaction nozzles in the nose and wings of the X-15. Decomposing hydrogen peroxide shoots out, dipping wings to create or offset rolls, raising, lowering or turning the nose for pitch and yaw control.

For slight changes in aircraft attitude or direction, it may be necessary to play two reaction streams of uneven strength against each other. This is how the Atlas ICBM's "vernier" (fine adjustment) control rocket motors operate.

As space travel goes, the principles of reaction controls are relatively old; they were checked out years ago in an earthbound device dubbed the Iron Cross. It consisted of two "I" beams so balanced on a single gimbal joint that they tended to assume a horizontal attitude when a "pilot" was seated in a cockpit mockup at the end of one girder. Conventional controls were linked to nozzles releasing streams of air under pressure—tilting, raising or lowering each beam.

Construction: Since the heat thicket is the natural habitat of the X-15, great care has been taken to keep the aircraft in one piece and the pilot cool, even un-

(Continued on page 60)

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(Continued from page 58)

der conditions of re-entry, as the plane dips back into the atmosphere at 4,000 mph. To that effect, the structure is primarily steel, with the exception of the side protuberances. These are made of beryllium, a metal even more resilient to heat, distortion and "creeping." Since the side bulges have enough volume to accommodate accessories, control cables, actuators and associated systems, the cylindrical fuselage can become one long integral tank—for fuel (anhydrous ammonia) oxidized (liquid oxygen) and gas generator (high test peroxide). No details have been released on the refrigeration system, but the short duration of the re-entry phase means that temperatures inside the cockpit will not rise to any critical extent. The leading edges of the wings, the nose tip, and the side bulges, on the other hand, may be subjected to temperatures as high as 1,000 F.

Instrumentation: Speedometer, altimeter, machmeter and all kindred instruments cease to work at the X-15's "operational" altitudes. Therefore, an inertial navigation package similar to the ballistic missile's will act as the pilot's reference—tell him his rate of speed, acceleration and deceleration, his plane's attitude, altitude and position in space. Navigation is much more of a problem than was the case with the earlier crop of X-craft. An average flight will cover a respectable distance of some 400 miles; and all flights must end at Edwards AFB dry lake field, probably the only place in the world where an aircraft can touch down at some 200 mph on two slim skids and stay in one piece.

To cram these multiple instrument systems into the X-15's nose section along with the reaction controls, the designers have called on miniaturization of the ballistic missile order. All the nose instruments ordinarily contained or activated by a ten-foot nose boom have been shrunk into a hemisphere six inches in diameter. The radar beacon system designed and built by the Stavid Engineering Company and used for radar tracking from the ground, has been subminiaturized to flashlight size.

So fast has been the pace of aeronautical and astronautical progress that the X-15, advanced though it be, is no longer a singular marvel but one of a number of technological miracles in our immediate future. Let's peek into the next decade of spacecraft as far as Security permits to see the pattern of the first few years of the age of space. These are some of the other stepping stones on our long, uncertain road to the stars:

The "Boosted" X-15: Some 700 million dollars were poured into the Navaho Intercontinental Guided Missile Program over the past five years. It was finally cancelled a few months ago because of the unexpectedly rapid development of the faster ballistic weapons. But our national investment may not be a total loss after all. We may put some of the Navaho "hardware" to good use in our space program.

The original missile was to consist of a huge ramjet-powered craft pushed to operational speed and altitude by a mammoth rocket booster package. Originally it was intended that this booster rely on a single 400,000 pounds-of-thrust rocket engine; but due to development difficulties with a powerplant of such an unprecedented size, a configuration of three engines, each of them developing around 135,000 pounds of thrust, was decided on. Fifteen of these units were completed

(Continued on page 62)

ROLL-OUT OF THE F-27

• Production model of Fairchild F-27 turboprop transport rolled-out at the Hagerstown, Md., plant. Fully pressurized and equipped with weather radar, it was specifically designed as a fast economical transport for local air lines and also meets the requirements of business concerns who have a need for an aircraft with airline type of comfort and speed. A total of 14 airlines and 13 business firms have placed orders for 93 F-27's, the first to be delivered in June to West Coast Airlines.

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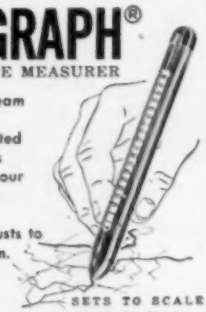

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(Continued from page 60)

before the end of the project; of these, seven have been fired to date, with varying degrees of success.

Now it happens that North American Aviation, builders of the X-15, also turn out to be the creators of the Navaho weapons system. In addition, the Rocketdyne division of this company designed the liquid-fuel rocket engines for the X-15 and the Navaho booster alike. From that point on, it is a fairly safe bet that a marriage between these designs will take place, if they are at all compatible. It would be one way of using up the left-over boosters, and of catapulting the X-15 into a new range of records and superlatives. Another possibility is that either the Atlas or Thor rocket vehicles will be used as booster.

The boosted X-15 would be ground launched; standing in a vertical attitude, it would climb skyward on the thrust of the booster alone. The climb would subject the pilot to accelerations of more than six times earth gravity—tolerable, but necessitating an autopilot to handle this arduous part of the flight. Automatic ejection procedures for the pilot in case of engine failure is probably another requirement, in view of the uncertain past performance of the booster and of large liquid-fueled rockets.

The booster would drop away at 90,000 feet, having by then exhausted its fuel and oxidizer. At that moment, it would have imparted a velocity equal to about three times the speed of sound to the X-15. Then the rocket plane's own engine would take over—with the aircraft already traveling at great speed, in an attitude of steep climb, and beyond 99 per cent of the earth's atmosphere.

All indications are that the boosted X-15 would be very close to being a manned satellite. It will be able to achieve and exceed altitudes of 400 miles. Its top speed will be somewhere around 5,000 to 6,000 mph. Its range will take a quantum jump to about 1,500 miles (vs. 450 for the air-dropped type). On re-entry into the atmosphere, it will be subject to severe heating conditions—will have to glide at a very shallow angle, allowing heat generated to slowly radiate into thin air.

Alternatively, the tremendous energy resulting in the heat build-up on re-entry may be dissipated in a series of skips in and out of the fringes of the atmosphere, an idea first presented by the Saenger design team in Germany during World War II. Riding a celestial roller-coaster around the globe, Dr. Saenger suggested, was one way to impart near-unlimited range to a strategic bomber. As it turned out, the Luftwaffe never had a chance to try out his scheme—and a good thing, too.

However, in 1957, the U. S. Air Research and Development Command conducted a competition for a project bearing the designation ROBO. This seemed to be the Saenger "round-the-world" skip bomber brought back to life. ROBO is a contraction of Rocket Orbital Bomber, and a part of the competition under this name called for ultra-high speed glide rocket planes. Indications are that an even more advanced X-15 may be North America's entry into this race. END

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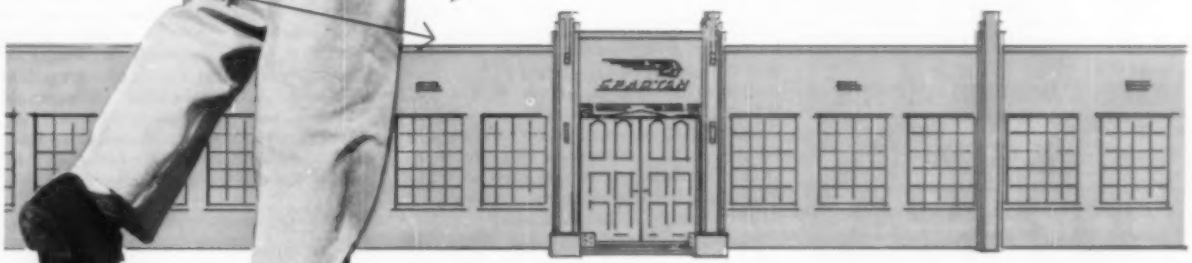

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Aspects of the Space Race

(Continued from page 26)

quirements as to speed, range and altitude for a nuclear-powered aircraft. GOR-81 is, of course, classified.

Work on the ANP program has proceeded ever since but, as is commonly known, at far from the pace of "crash program" urgency, since technical problems lay in advancing the state of the art and available funds had many demands. On March 6, 1958, Deputy Secretary of Defense Donald A. Quarles appeared before the Joint Congressional Committee on Atomic Energy explaining that the Air Force and the AEC would jointly expend about $150 million on the ANP program for the next few years—a reduction from the annual $250 million previously jointly spent. He said:

"At the January meeting (when he had previously appeared before the committee) we discussed the possibility of a program for the development of a nuclear-propelled, manned aircraft that would demonstrate nuclear flight at an early date, even though it might fall far short of military objectives for a combat aircraft.

"It was thought at that time that such an 'early flight' development might contribute significantly to the military objective by giving us experience with the operation of such an aircraft.

"We were also conscious of the fact that the Soviets may well be working on similar developments and that they might seek to obtain propaganda value by demonstrating manned nuclear aircraft flight even though, in doing so, they abandoned military utility as an objective."

Mr. Quarles said that his office had come to the studied conclusion that such an early flight would divert all-too-scarce talent from the main objective. The program had therefore been abandoned. He continued:

"The program which we are now presenting to your committee is therefore substantially the program we discussed earlier this year. It emphasizes the basic work that needs to be done on higher temperature materials and other reactor design problems to achieve reactors that can operate at higher temperatures and therefore produce higher thrust with a lower weight encumbrance on the aircraft and a lower radiation hazard to the crew."

That is where the matter of the atomic-powered aircraft development stands as of this writing.

After presumed soul-searching and much debate, the Defense Department has divided responsibility for creating defense against an intercontinental missile between the Air Force and the Army. The ultimate configuration of the complete system, which includes detection and defense, has not been determined. Nor has it been determined whether the Air Force or the Army will have final operational responsibility.

The Air Force has been given authority to continue development and installation of the detection phase of defense against intercontinental ballistic missiles. This consists of installing newly-developed radar, with range in the neighborhood of 3,000 miles. The warning time would probably vary from 30 to ten minutes, depending from where the missiles were fired. Contracts totalling more than $400 million for the radar and sites have been let.

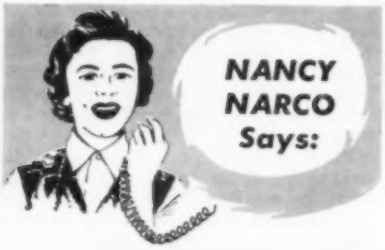
Army has been given responsibility for developing the actual missile which

(Continued on page 66)

WHERE AM I?

Although that looks like an interesting new development in airport runway design for short-landing aircraft, it's not. The river, crossed by an express highway, is well-known, as are the craft manufactured in the large new plant.

(Answer on page 83)



STARGAZER

Now that summer's approaching, comes the problem of thunderstorms. Not much need to remind anyone that they ought to be avoided, but here's some information on how they can be avoided which you might not know about.

The nationwide radar network of the Air Defense Command will provide pilots—private, commercial, military alike—with suggested courses to fly which will keep you out of the black stuff. These powerful radars can see thunderstorms for miles around; can see you, too, and give you vectors around the worst stuff.

Here's what you do if you're confronted with electrical storms. Call and listen on the emergency frequency of 121.5 (they prefer you to use 133.2 but you probably don't have it) and say: "Stargazer, this is—Identification, Position, Heading, IFR or VFR, OVER."

Your mention of "Stargazer" automatically means you desire radar advisory service, and you will receive a reply from the nearest ADC radar with instructions, giving headings to follow to avoid the "cells" which contain the worst rain, turbulence, lightning and other vicious elements.

If for any reason they cannot give you assistance, they give it to you straight and simple: "Unable."

If you're IFR, radar will contact ATC for a change in your flight plan if they deem it advisable. If no ATC connections, they'll give you suggested new heading and it's up to you then to contact ATC for a change.

This radar coverage does not blanket the entire United States, especially at low altitudes and in some interior sections, but the total of 93 ADC radars does give effective storm surveillance over wide areas of the country. In addition, of course, there are many Weather Bureau storm detection radars which provide information on thunderstorm activity for inclusion in regular half-hourly weather sequences.

Pilots who have tip-toed around thunderstorms with radar vectoring tell me it's uncanny how radar can give you a really smooth ride. Might file this dope on "Stargazer" in the back of your mind to make your summer XC work a lot easier. One final word, we're reminded by ADC that these radars are there primarily for defense purposes and pilots should use good judgment when requesting assistance.

Regards,

Nancy

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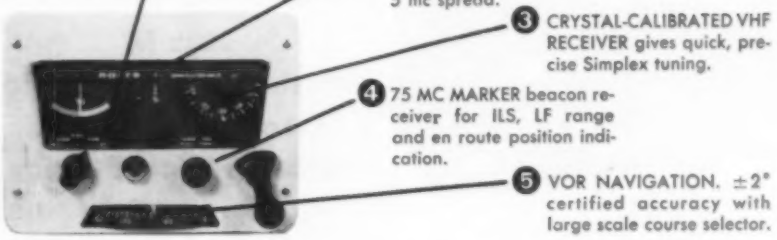
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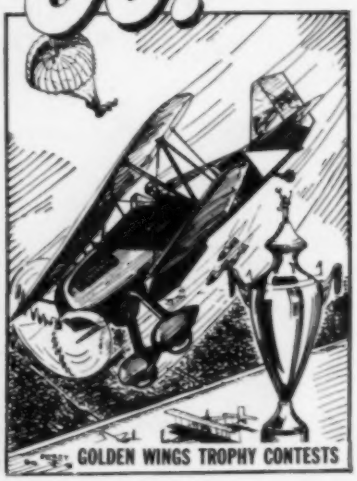

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(Continued from page 64)

would be fired to intercept an enemy ICBM. Indications are that Army will concentrate on an advanced stage of their Nike-Zeus system. The cost of such a missile complex has been estimated at from $6 to $8 billion.

Between the radar and the actual defending missile are many steps—communications systems, computers for data correlation and data handling, tracking radars and other technical gear. Development of this equipment is the responsibility of both Army and Air Force.

There has been extensive discussion as to how much and in what way the newly created Advanced Research Project Agency (ARPA) will affect the research and development programs of the Services. The first major announcement from the director, Mr. Roy W. Johnson, delegated certain projects to each of the Services and seemed to indicate that ARPA will, originally at least, content itself with being a policy and decision-making agency.

In this first pronouncement, ARPA handed certain moon-scanning exercises to the Air Force, others to the Army and gave a tracking and data collecting task to the Navy. Presumably, the instructions to each were explicit in defining and limiting their project. The Services have been unanimous in hoping that the new Agency will not itself get into the operating side of research and development, although its charter is broad enough to permit that.

There have been indications for some time that certain fundamental changes could profitably be made in some of our military research and development methods. These have appeared in speeches, in testimony and in interviews with R&D officials. Three criticisms, or suggestions, appear more frequently than others.

First, devise a new method of rewarding successful contractors in the development field. Currently, if two companies are given contracts in a development competition, one may fail and the other succeed, but both are paid approximately equal for their work. The successful firm should be rewarded for its energy and ingenuity.

Second, attempt to reduce the peaks and valleys in the military research and development business, so often responsible for loss of money, time and technical skills. In the case of the Atlas missile, for instance, work began in 1946; was stopped in 1948; continued as possible with company funds until 1954; and resumed again with Air Force Funds and a high priority, beginning about November of 1955.

Third, is the old problem of obtaining quick decisions. It is not new, but it may be more and more important with the pressure of events.

Testimony on the hill from officers of all three services has pin-pointed this one factor, stressing particularly the number of boards and committees which must be passed before final answers can be had on vital projects. If ARPA does no more than solve this problem, it will have been worth its weight in gold to the work of national research and development. END

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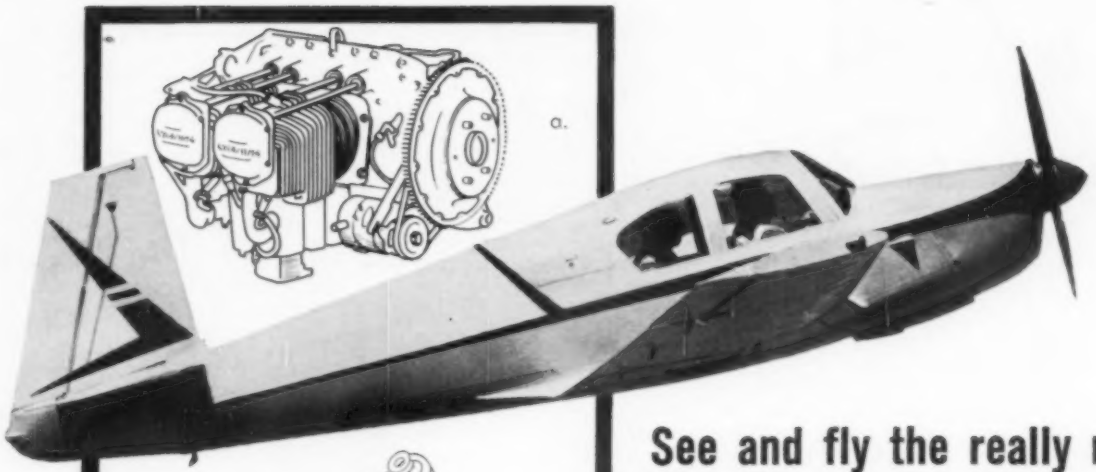

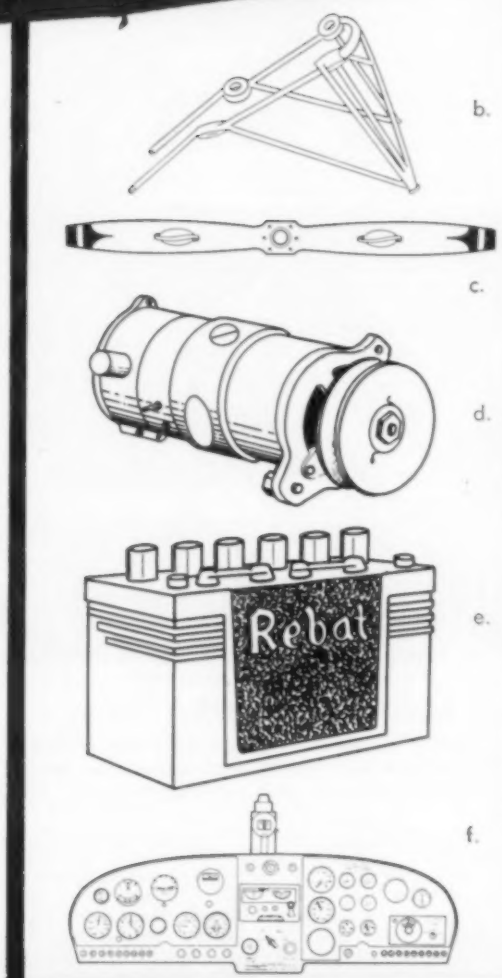

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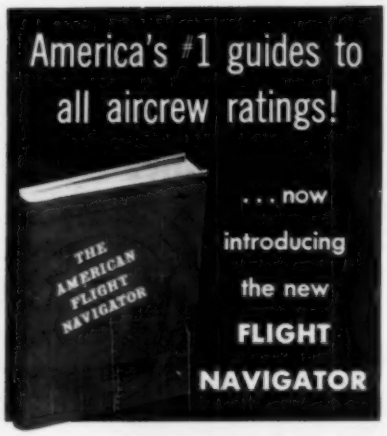

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Inexperienced Pilots and Weather Accidents

(Continued from page 49)

an airplane famous for being a good instrument performer. The inexperienced pilot's problems would often be multiplied in such a case. The plane might well come apart much quicker if subjected to the same abuse. Remember, these airplanes will not arbitrarily assume dangerous attitudes, and will maintain or return to level flight if controls are not abused. It is only when abnormal attitudes are reached by improper control that they cannot return to level flight in a few oscillations due to inherent stability.

Pilots who have given extensive flight instruction can visualize the mistakes a novice might make when suddenly he finds himself in trouble. His moving of the controls in the right direction is mere chance, to say nothing of exact time or magnitude required. Stability, good or bad, will not save the airplane. A few pounds of stick force is nothing in the face of panic. Many different things may happen in a matter of seconds. One man may immediately go into a spiral. A few will dive. Others may concentrate on the bank-and-turn, and unconsciously slowly pull the nose up until speed is greatly reduced or a stall induced. The low speed will startle the pilot. He will push the control forward and hold it until original speed is reached. This can result in a dive over the red lines. He will now pull back and hold it. He may go over the top in a loop or whipstall. The resulting dive will be more severe than the first. Probably he has forgotten everything but the airspeed and is no doubt spiraling along with the dive.

In the above, we have assumed the pilot to be late with his control movements. If the airplane had good longitudinal stability and was trimmed for 160-IAS, and he completely released the controls when he first observed the low airspeed, a steep dive would result with the airplane trying to return to the 160-IAS trim. The nose would be so low that, even though it immediately started to rise after passing the trim, it would very easily exceed all "red" lines. The nose would now be coming up sharply, trying to return to the 160-IAS trim and again would go through it so fast, and at such an angle, that it would no doubt whipstall before the nose could start back down. The resulting dive could easily be straight down. This high speed and the airplane's efforts to get back to its trim could result in G-load factors greater than its design.

What is stability in an airplane? Exactly what it says, "stay ability"; an airplane's ability to stay put. Directional stability is usually the result of a combination of the vertical stabilizer, dorsal fins, and dihedral. Lateral stability is usually a combination of dihedral and directional stability. Directional and lateral stability are closely related since each directly affects the other. If lateral is bad and a wing goes down and stays, a

(Continued on page 70)

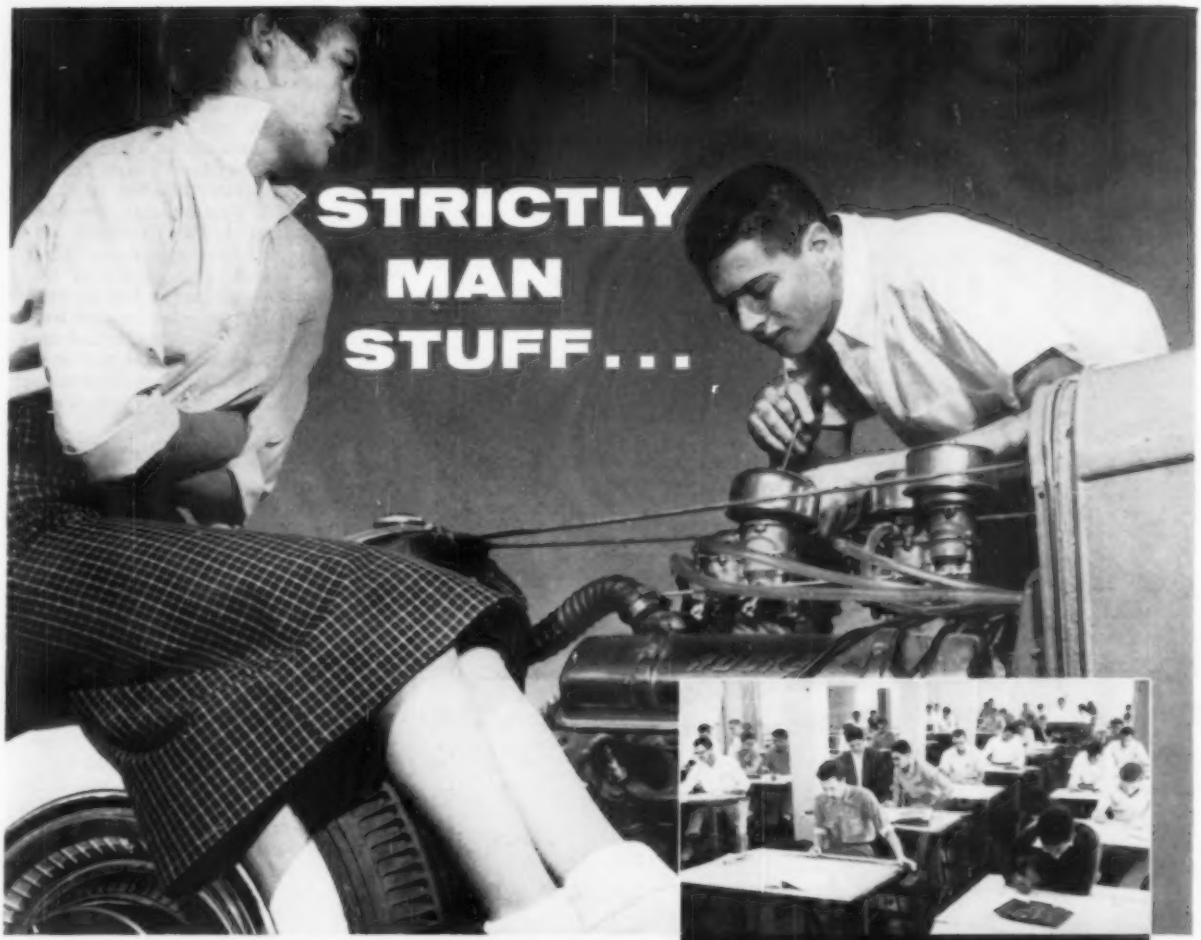
ROLL-OUT—THE DC-8

● First production model of the latest jetliner, the Douglas DC-8, has emerged from the huge plant doors decorated with emblems of the airlines in whose service it will be flying soon.

Some three years of design and construction as well as more than $200 million of Douglas money went into the 590-mph transport, which is slated to enter service on U. S. routes in late 1959.

The first nine will be used in an accelerated test program leading to CAA certification before the 138, ordered by 13 domestic and foreign air carriers can be delivered.

Early models will be powered by the 10,000-lb. thrust Pratt & Whitney JT3, (J57) engines, later versions will have the Pratt & Whitney JT4 (J75) or the British by-pass Rolls Royce Conways. Accommodations range from 118 to 176 passengers.



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(Continued from page 68)

turn will result. Also, if directional is poor, allowing the airplane to yaw or turn, a wing will go down. If the airplane is to stay put, both lateral and directional stability must be good.

Longitudinal stability is a function of the horizontal stabilizer and bungee spring, and is greatly affected by C. G. loadings. CAA requirements are such that longitudinal stability is usually satisfactory for all normal operations. Their rear C. G. climb requirements of free returning within ten per cent of the trim usually makes cruise conditions entirely satisfactory. While the longitudinal stability is always helpful for normal operation, it can contribute to overcontrolling when an airplane is partially out of control.

A neutrally stable airplane has no tendency to recover and is annoying to fly at any time. The inexperienced instrument pilot is just as safe with an unstable airplane as with a stable one, so stick forces and stability are not the answer to the trouble.

Now assume that an airplane is trimmed at 160-IAS, and when nose is pushed down to increase airspeed, stick forces for a normal load might run something like this: a 5-pound push for 185 mph; a 10-pound push for 200 mph; a 20-pound push for 225 mph; 30-pounds for 250 mph; and 40-pounds for 280 mph. Now if the 40-pounds were released at this 280, the resulting loads would be around 5-Gs. At this critical speed, if a few pounds of back pressure were applied by the pilot, it would easily exceed the structural limits. So, it is easy to see that the better the stability and the higher the stick forces, the more critical this could be. This condition has no doubt contributed to some of the failures, since we know that inadvertent high speeds have been reached when these airplanes are forced out of control.

If the airplane was neutrally stable (zero stick forces) then the only loads applied would be those exerted by the pilot, because it has no tendency to return to a trim speed. If a steady back pressure is applied from the trim, stick forces may reach 40-pounds pull at the stall. If the control was quickly released at this point, the airplane would no doubt dive straight down, and even though the nose started to rise as soon as the trim speed was passed, a speed of 300 mph might be expected if the pilot did not assist in the recovery. In this case, as in the release at the 280 mph, the better the stability, the higher the stick forces, so the more critical the results. If zero pounds of stick force had been required to reduce speed to just short of stall, no dive would result from releasing the control.

If the airplane were neutrally stable (zero stick forces), then the only loads applied would be those exerted by the pilot, because it has no tendency to return to a trim speed. If a steady back pressure is applied from the trim, stick forces may reach 40-pounds pull at the stall. If the control were quickly released at this point, the airplane would no doubt dive straight down, and, even though the

(Continued on page 72)

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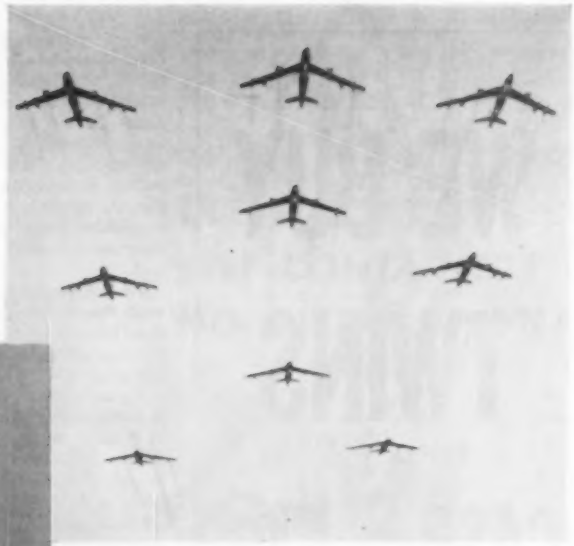

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(Continued from page 70)

nose started to rise as soon as the trim speed was passed, a speed of 300 mph might be expected if the pilot does not assist in the recovery. In this case, as in the release at the 280 mph, the better the stability—the higher the stick forces, so the more critical the results. If zero pounds of stick force had been required to reduce speed to just short of stall, no dive would result from releasing the control.

These climbs and dives are serious even with the wings level, but seldom if ever does more than one cycle take place until a wing goes down and a spiral adds to the problem.

To understand the problems of a spiral, it is necessary to understand the effects of a bank on the trim of a longitudinally stable airplane. If, as in the other conditions mentioned, the airplane is loaded with a Mid C.G. loading, trimmed for 160-IAS level flight and a wing is banked 45-degrees, the trim effectiveness falls off and can no longer hold the nose up at this setting. It will probably take a speed of 200 mph for the 160-IAS trim setting to hold the nose up in a 45-degree bank turn. A 60-degree bank would require a speed of something like 220 mph. Any degree of bank immediately puts the airplane below trim speed and, as a result, the nose will drop. Should gusty air or abuse of control cause a 60-degree bank, the airplane would be approximately 60 mph below trim, which would result in the nose dropping considerably. It will continue to drop until the trim speed is passed—approximately 220 in the bank. As before, the nose will start to rise as soon as the trim is passed, but since it is banked 60-degrees, it will tighten the turn more than it reduces the speed. The nose will be very slow in coming up; and the top speed reached will be higher than the straight dive.

Had this airplane been neutrally stable longitudinally (zero stick force), the nose would not have dropped when banked and only a moderate loss of altitude would have occurred. Also, if this airplane had good lateral and directional stability along with longitudinal stability, and is turned loose after the initial bank, it will tend to level out and return to the straight climb and dive conditions. On the other hand, if it were neutrally stable laterally, the climbs and dives in the turn could exceed all limits in a matter of seconds.

I am not advocating neutral stability or zero stick forces. I am only saying that positive stability is of no help to the pilot who moves the controls in the wrong direction; or moves them at the wrong time with the airplane exceeding all limits. Stick forces and stability are essential to the ease of flying for the experienced pilot who is capable of keeping airplane attitude within reasonable limits. Only through abuse of controls does the airplane attain a dangerous attitude. It is practically impossible to tear one of these airplanes apart, if speed is cruising speed or below.

Since good stability may only help the novice pull the airplane apart when well above the trim speed, how does stick

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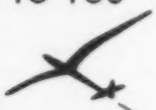

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force per G apply to this? How does it effect the airplane and what does it do for the novice pilot?

It seems the opinion of many that if stick loads per G are high enough, the airplane will not be damaged. This theory is correct in certain airplanes under certain conditions, but does not have the effect many would like to claim on our novice problems.

Again assume this airplane is trimmed at 160-IAS and 40 pounds of back pressure on the controls is suddenly applied. This might equal 5-Gs. These forces would be considered satisfactory in everyone's book and the loads would not seriously damage the aircraft. Had it required only ten-pounds of pull to get the 5-Gs, the forces would be considered light and it would also be easy to accidentally apply the load. Here stick force per "G" was helpful. But what about the loads when speeds are encountered well above the trim and Gs are being applied by the airplane's stability attempting to return to the 160-IAS trim? Remember the five-pounds push to 185 mph; ten-pounds to 200 mph; 20-pounds to 225, 30-pounds to 250, and 40-pounds to 280 mph. Now if this 40-pounds is released, 5-Gs will be applied with zero stick force. The only time figures are realistic for stick force per G on a longitudinally stable airplane are when loads are applied at the trim speed, or when applied to a neutrally stable airplane.

High performing airplanes can be made to react exactly as a high drag, slow speed airplane, merely by slowing them down and extending the landing gear. If this is done, and the airplane is trimmed for this slower speed, it will assist the pilot as well as any airplane with a lower cruising speed.

To build an airplane so strong and stable that a novice could not overpower it would be like building a car which could not be driven off the road. Much can be done to protect the man in the air, such as all-around beef-up, dive brakes, bob weights on elevator controls, etc., but nothing helps the one who dives steeply out of an overcast with 100 feet of ceiling. He, rather than his airplane, is the source of the problem. END

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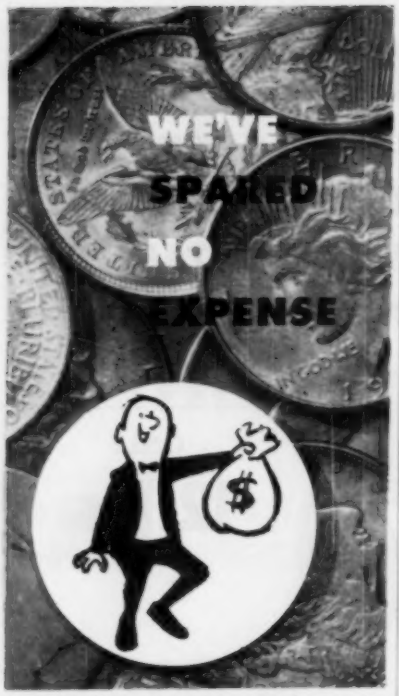

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Lockheed's Lensman

(Continued from page 42)

cause of the turbulence. However, Erik's still photos saw print in many a publication.

Miller is meticulous in checking out his own safety equipment, but he had to learn this precaution. On the flight that netted the famed P-38 tail boom photo, there wasn't enough room in the belly hatch for Miller, his aerial camera and a parachute. Erik discarded the chute but had a flight mechanic tie a rope around his waist to keep him from sliding too far into the slipstream—and beyond. Only after the shots were finished, did Miller notice his rope secured to a piece of mere half-inch tubing!

Miller doesn't consider aerial photography hazardous. Lockheed carries a Lloyds of London life insurance policy on him—$25,000 in propeller-driven aircraft and $50,000 in jets for the 150 flying hours he averages each year. He has to pay his own insurance for the drive to the airport. Actually, his greatest annoyance comes from the extreme cold at altitude. His ears and fingers have been frost-bitten so often that they ache sharply when the temperature falls to 40 degrees. He's tried everything—electrically heated gloves, silk liners and mittens—but they all get in the way and he works bare-handed.

Miller's first jet ride was a liberal education. He was assigned to accompany Paramount Newsreel cameraman Sam Greenwald to Williams Field, Ariz., to photograph the famous four-plane aerobatic team, the Air Force Acrojets, in action. When Greenwald became ill, Miller accepted his assignment, even though he did not consider himself an experienced motion picture photographer.

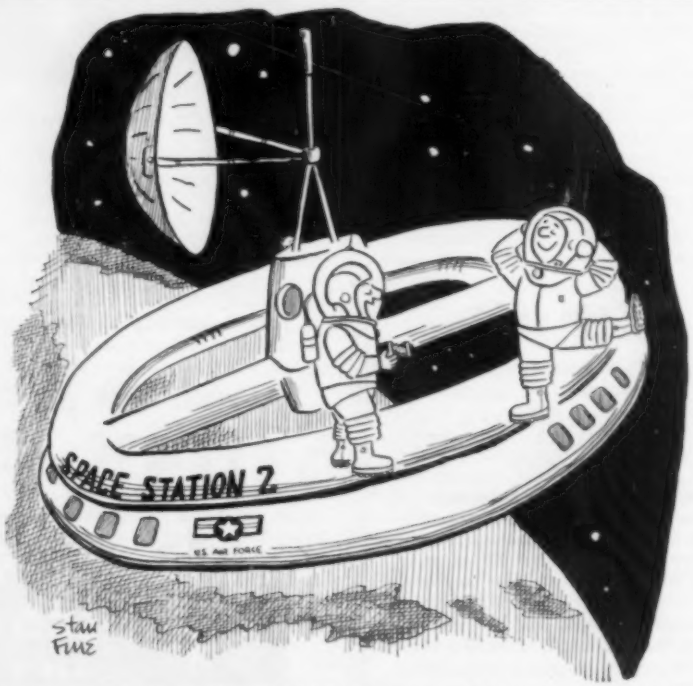
"We mounted Greenwald's 35mm Eyemo in the front seat of a T-33 and took off on a practice run," he reported. "I had to keep my eye glued to the finder and tell my pilot when the other planes were in view. We went through the complete Acrojet routine, more inverted than right-side-up, but I was too busy to appreciate the view. Then we did the whole thing again next morning with a load of film in the camera. The footage made theater screens all over the country."

Even today, Miller has been through the sound barrier only once. Coming down from a photo flight in an F-94-C, test pilot Irving Pratt dove him to Mach 1.2 from 35,000 feet over Antelope Valley. "It felt like free-falling," said Miller.

Nearly all of Miller's aerial photos are made during production shake-down flights so that it is seldom he can pick a particular background for his shooting. He makes up for this by extra careful use of highlight and shadow.

The veteran uses almost every type of camera available. He has made cover photos of F-94 rocketry with rapid-fire sequence K-25's. Many photographs through open windows or hatches are made with an old F-8 aerial camera. Frequently he uses a ten-year-old 4x5 Speed Graphic, shooting through plexiglas windows which, incidentally, give little or no distortion to the finished picture. Some photos have been made with a 2¼x2¼ Rolleiflex, but Miller's favorite, all-around camera is the 35mm Nikon with a Zeiss 21mm, 90-degree, wide-angle lens. With careful fine grain developing which he personally supervises, he is able to print 16x20 glossy blow-ups from his miniature

(Continued on page 76)



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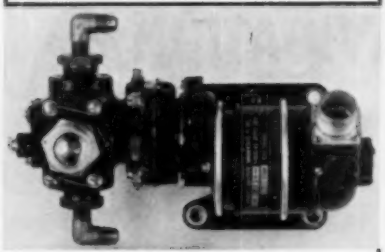

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(Continued from page 74)

negatives without objectionable grain.

The 35mm Nikon went to the shop recently for major repairs. Miller was shooting pictures from a T-33, of an F-104 firing rockets. His primary camera was the automatic K-25, but he had the Nikon sitting on the canopy ledge in case an unusual picture opportunity presented itself. Just before the rocket firing, during the count-down, both planes hit a bump that lifted the Nikon into the air and dropped it into the cockpit where Miller saw it floating around, but couldn't take his finger off the trigger of the automatic sequence camera to catch it.

"I doubt even the best photographer can make consistently top flight aviation pictures unless he knows his airplanes," says Miller, who has been around aviation since 1927 when his older brother John, an Eastern Airlines Captain since 1940, bought a cracked-up D-1 Standard from Gates Flying Circus and rebuilt it in the family garage. While his brother barnstormed the Standard, Erik completed high school and spent a year studying engineering at Antioch College in Ohio. He finally quit school to help his brother operate the first commercially-owned autogyro in the United States.

The Miller Brothers operated an approved repair shop at the Poughkeepsie Airport from 1928 to 1931. The bulk of their business during this Prohibition era was repairing expensive Bellancas, Fokker Universals and Standard D-25's for nattily dressed gentlemen who wanted their airplanes fixed in a hurry, for cash —and never asked for a receipt. Erik soloed in 1934 in an OX-5 Challenger, but never sought a license. He concentrated on aerial pictures of the New England and New York countryside, with his brother as pilot. These pictures, shot with an old 4x5 Graflex, brought up to $100 per shot.

After working for his sister, Lee Miller, as lab operator for her New York City fashion photographic studio, Erik dropped out of both aviation and photography for three years, working in Egypt as an air conditioning engineer. However, photography and aviation were in his blood. He returned to the states and headed for the West Coast. He had seen photos of an early P-38 in the "National Geographic" and went to Lockheed's employment gate at Burbank where he finally got a job in the Photo Department, making prints in the darkroom at $25 per week. When the Public Relations Department needed a photographer late in 1941, Miller was loaned to them. He's been there ever since.

Bert Holloway, now Lockheed Corporate Director of Advertising and Sales Promotion, asked for a series of photos of the Hudson bomber. "Portray the character of this ship" said Mr. Holloway. That basic premise has applied ever since to all Lockheed publicity photographs.

However, one of the more popular wartime photographs of the Lockheed Ventura was taken quite by accident. The pilots were maneuvering for position in rough air when the planes drifted too close together. As both veered away,

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Miller was slammed against his open window. The shutter tripped by impact, bringing back the best picture of the day.

Preparation for a photo flight may take many days. It took nearly six months to get the first in-flight photos of the F-104-A. A B-45 recon jet was borrowed from the Air Force with Lockheed picking up the tab for fuel and crew. Miller removed the window from the tail gunner's position and climbed aboard. The space was so limited that he used only two Nikon 35mm cameras, one with color and one with black and white. The one hour flight was flown at over 400 mph.

"Riding that B-45 tail was like a saddle on a rocket," said Miller. "The rate of climb and cruise was so fast that I felt just like a satellite. There was a shelf in the way and no windows except the gunner's open port. I was working in such limited conditions that I couldn't have taken a deep breath if I'd wanted to.

"We planned the flight carefully beforehand so that the F-104-A pilot put his plane directly in our slipstream and held it at 30 feet from my lens while I emptied both cameras. Once we joined up, it took just four minutes each way and it was all over."

As aircraft become continually faster, the problem of finding a suitable camera plane becomes increasingly difficult. Miller considers the Navy Neptune P2V series the best propeller-driven camera plane in the air. The Neptune has two big side windows in the aft section, an aft belly door large enough for photographer, May West, parachute and camera, large plexiglas astrodome that can be opened in flight and a clear nose. However, the Neptune is no match in speed for the new supersonic fighters of the Century series.

"The biggest headache I have today," he says, "is a camera plane and a fast 'target' plane. I always want to shoot close, really close, and the speed difference makes it rough on both photographer and pilot. All of our production and test pilots are cooperative and patient when it comes to flying good picture formation. Good in-flight photography is essentially the work of pilots and cameraman."

One of the reasons Miller brings back so many striking air-to-air photos is that he doesn't let ship-to-ship radio difficulty abort a photo mission. When planes are in close formation, Miller prefers to direct the "target" plane by hand signals. In the case of jets, it's not uncommon for him to be seen "pushing" the target plane 20 feet away, by using just one finger for directions.

One might think that a job like Erik's would entail much travel. Actually, Lockheed's lensman has been away from Southern California on business just twice in 17 years. Once he flew to Honolulu, escorting a group of nine news photographers to shoot the radar Constellation (WVA) story. On this junket he got two hours sleep in two days. While the visitors were making ground pictures, Erik made the intricate aerial setup of the radar picket plane in formation with a flight of jets over an aircraft carrier.

Miller was assigned to cover the X-17.

(Continued on page 78)

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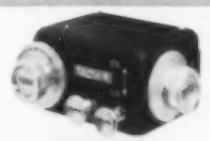

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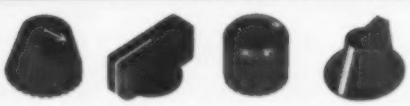

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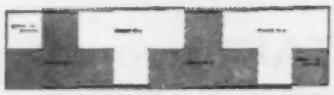

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(Continued from page 77)

re-entry test missile at Patrick AFB, Florida. His striking night photograph of the missile just clearing the launching ramp was one the scientists said he'd never get without complicated—and unavailable—electronic triggering circuits. Miller set up a rented 35mm Exacta 500 yards away and installed a 420mm telephoto lens. When he saw the visual flash of the missile's launching rocket, he tripped the shutter and made a picture that was in constant use for several months.

In the handy-hints-to-photographers department, Miller believes that the greatest single flaw in aerial photographs is camera movement. Even the professionals don't always hold a camera still. Miller considers the ability to change concentration instantly from composing a picture to tripping the shutter *without movement* as the greatest single asset of the aerial pictorialist. He shoots most of his black and white at a fairly slow shutter speed (1/250th of a second) and seldom uses a color correction filter because the plane in the foreground is always his target—not the background miles below. In exposing color film, Miller keeps his exposures slightly below normal to improve contrast.

Beyond that, good airplane photography is just like any good photography—Be in the right place at the right time, and have plenty of film. END

Soaring the Andes

(Continued from page 34)

moderately turbulent air towards Quito at the rate of 300 fpm. Our flight path paralleled the lee side of the east ridge, resulting in a slow climb as we passed through the downdraft areas. At 500 feet we were clear of the airport traffic pattern, permitting a right turn toward Pichincha and higher ground. Here we knew we would encounter lift to expedite our climb to release altitude. Below was picturesque Quito with its tiled roofs, and innumerable churches. Directly to our right the ground sloped up steeply, and halfway up the mountain, we were amazed to see pastures and cultivated fields. At 13,000 feet a few Indian huts hugged the slope. Nearing the higher ground, we found our lift. The rate of fpm climb indicator suddenly shot up to 500 fpm and increasing steadily. Paralleling the slope, we passed 10,500 feet. The air became increasingly turbulent as we entered areas of both ridge and thermal currents. While circling back in a right turn, the Cub, like a startled rabbit, shot forward. I kicked hard left rudder, and looked back. Chicho had pulled his release.

This was an unforgettable scene—the graceful form of the sailplane circling ever upward in a thousand fpm thermal. Groups of Indians stood like tiny statues below. On the outskirts of the city, some 300 children disgorged from a school building to see "the man in the kite." Chicho was having a wonderful time. Lift seemed to be everywhere. To the

northeast, dust-devils covered the valley, and along the lee side of the north slope, a cloud mass was flowing downward, a phenomenon known as a "Foehnwall", giving the appearance of a hugh waterfall of clouds.

Alto cumulus clouds were now forming rapidly, with the cloud base at 17,000. By gliding parallel to the slope, at 45 mph indicated airspeed, constant lift was encountered. Continued, sustained flight in the sailplane was now assured, and by utilizing the ridge effect, and spiralling within the thermal currents, altitude was rapidly gained to the cloud base. At 16,000, Chicho headed the ship southwest towards Pichincha. Inside the sailplane it was cold and quiet. The steadiness and power of the lift was pleasing. The grandeur of the Andes summits was a spectacle of splendor. By daring maneuvering, Chicho penetrated between the jagged crags to the crater of the old volcano, and at times only 100 feet above the rocks, crossed the great pit. Never before had a sailplane dared approach the historic heights. Here truly was high adventure!

For more than an hour Chicho maneuvered the Schweizer over Pichincha, having no difficulty remaining between 15 and 16,000 feet. One could roam across the sky at will, diving low over a group of Indian huts on the slopes, or leaving the highlands to circle over ancient Quito. Hundreds of onlookers had gathered at the airport. It was 1:15 p.m. when, at 2,000 feet just over the control tower, the sailplane found another area of 1,000 fpm lift. Chicho did aerobatics, steep turns and lazy-eights for 15 minutes, without any loss of altitude, and then with full spoilers open, circled the field several times, and gently touched down. Ecuadorians, together with the various tribes of Indians swarmed the field to come close to the magic white bird. Thus, among the old and the new, ended the first soaring flight over the Andes. I must confess that I shared something of their awe. It was a terrific moment.

Our soaring activities continued without interruption for the next four days. However, the lack of oxygen severely handicapped us, keeping our duration per flight down to less than two hours—about the maximum we could physically endure at 16,000 feet. Each flight revealed varying atmospheric conditions, permitting us great latitude to explore regions of lift in widely separated areas. My own experience was rewarding, and confirmed our earlier aspirations. Flights of five to six hours duration would be routine here. For the more adventurous, long cross-country flights over the high summits of the Andes' chain could be ventured. This of course would involve expensive equipment, starting with a 35 to 1 glide-ratio high performance sailplane, completely equipped with oxygen and two-way radio communications.

The pilot, of necessity, must be able to speak and understand Spanish, and have emergency survival gear, in event a landing is made in remote regions. To soar over this awesome land is an experience without equal. I hope we have left a trail that others will seek. In the realm of soaring, the Andes are a pilot's dream. END

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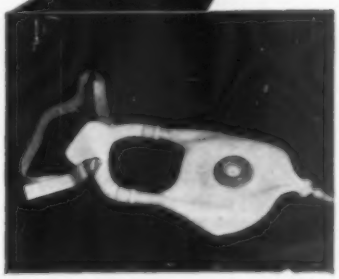

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Air Age Knights

(Continued from page 45)

Brown gazed from his study window over the ashen Scottish sky with its constantly falling rain.

"Offhand," he said without looking around, "I would say you are daft and that you won't make it." He turned to face Alcock. "Have you any idea of what the North Atlantic is like and of how little is known of its skies, Captain?"

"I know that the flight is fraught with danger, if that is what you mean," Alcock said.

Brown nodded but did not smile. "For 30 days in the year, Captain Alcock—only 30 days out of 365—would it be possible to make a nonstop flight over the Atlantic. It must be done at full moon. We would have no knowledge of weather ahead after we left the Newfoundland coast—"

"We?" Alcock interjected.

"I said, 'we' because if you are set on flying the Atlantic you will need a good navigator and I reckon I am as good as you'd find in Britain."

Alcock stuck out his big hand.

Brown was saying, "There is no such thing as a weather report. The distance is just under 2,000 miles from St. Johns to Ireland and between the two points there is nothing. Nine days out of ten the North Atlantic is whipped somewhere by gales. If one were forced down, there would be scant hope of coming out alive. Your life insured?"

Alcock nodded.

"That is well. You have extensive flying experience. We might even make it. Now, about beefing up the machine. The greatest stress dangers are in turbulence from electric storms and heavy wing icing. Harry Hawker and Grieve ran into both when they tried to fly the Atlantic a couple of months ago."

Alcock nodded again and sat down with a sheet of paper. He made notes for suggested structural alterations. But there were some things about which neither he nor Brown could do anything. Airspeed indicators of the time were next to useless; altimeters were even worse. Pilots had hit the waves while their instruments still showed 2,000 feet.

The scheme for flying the Atlantic nonstop was submitted by Alcock to the British Air Ministry and approved but held up pending the end of the war. Thus, it was not until April, 1919, that Alcock was assigned a Vickers Vimy bomber for his attempt.

The Vimy had been designed and built in a scant four months by Vickers in 1917 as a long range heavy bomber. It was powered by two 350 hp "Eagle" Mark VIII Rolls-Royce engines and had a cruising range of just over 1,500 miles. Its cockpits were open—its controls entirely manual. Alcock and Brown stripped her armaments and other furnishings to lighten it and make room for supplemental gas tanks. A fuel load of 865 gallons of gas and 50 of oil was found possible. On this Alcock calculated the Vimy would fly 2,440 miles in calm air. He wanted no guesswork. Guesswork had brought Commander Grieve and Harry Hawker to disaster in their attempt from Newfound-

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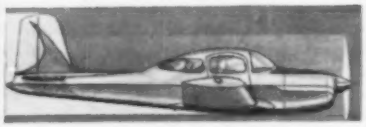

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land to Ireland. Nine hours after leaving Newfoundland, they had used up more than half of their fuel and, realizing they lacked the range, had ditched in a stormy sea 200 yards from a small Danish freighter, the *Mary*, and had been rescued.

On May 4, the Vimy was shipped from England to Newfoundland where, on June 9, Alcock and Brown made their first test flight. The radio broke down, but on the second test flight on Thursday, June 12, everything went off smoothly. What most worried them as they prepared for the great adventure was lack of weather knowledge. At that time there were no reports. Not until long after Lindbergh's flight did the United States and Britain realize the value of such.

When the airmen awoke on the great day, Saturday, June 14, it was cold and gloomy, with a gale force wind rising. The engines were tested while the mists howled crosswise over the improvised runway where a few hundred people had come to see the start of the seemingly suicidal attempt. As the day advanced, the fog lifted and the wind decreased slightly. Brown was drinking a cup of coffee when Alcock wandered into the small cafe. "I think we'll snatch something to eat now," he said, "and go."

"With this crosswind?" Brown asked in some surprise. "The runway is mighty short and the wind still pretty strong."

"Look, my boy," Alcock snapped, "if it's lousy here, it may be quite good at sea. If we put it off now, we might be delayed for weeks. Let's eat and go."

As the two men walked from the restaurant, the rain lashed in sullen squalls and the wind rose suddenly but Alcock refused to heed the advice of bystanders that the flight be delayed. The plane was held into the wind by ropes and pickets. One of the ropes tore loose and drew taut around the gear, causing minor damage. It was quickly repaired and, within an hour, Alcock and Brown climbed into their seats, although the wind threatened to capsize the ship even before it got under way. The take-off was uphill but into the teeth of the gale blowing now at about 40 mph.

Under normal circumstances the plane could have lifted off with a good margin of safety in such wind but the Vimy was loaded to a gross of five tons, including gas of three and a half tons. The runway was rough, being merely improvised. There was nothing propitious about the prospect of the take-off. Nonetheless Alcock ordered the chocks away. The big biplane strained and shook, then began to roll clumsily over the uneven ground. Spectators were sure it would collapse. But the Vimy slowly continued to pick up speed, swaying from side to side like a freight train rocking on the tracks. Yet it still seemed she was too heavily laden to break loose. At 300 yards she was still lurching but now committed to clear the hedge which marked the end of the runway, and beyond which was a ten-foot ditch. At the last split second the wheels left the ground and cleared the hedge by inches and the bomber began to climb as the gale on her nose provided lift.

Over the inter-com Brown told Alcock

(Continued on page 82)

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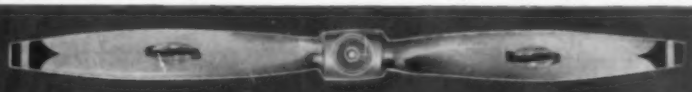

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(Continued from page 81)

to set course southeast, 124 degrees magnetic. Visibility was excellent for the following few minutes and Alcock's suggestion that bad weather on the land might mean good weather at sea seemed to be bearing out. Soon, however, they reached a bank of cloud which introduced a vast area of fog. For seven hours the two men cruised in this fog, unable to see either sky or sea except for occasional brief glimpses.

Twenty minutes out, Brown had made an unhappy discovery. The wind-driven propeller of the generator which powered their air-to-ship radio had been snapped off. With it sheared away, they had no juice for their communications and could neither transmit nor receive. They were solely at the mercy of their plane and the storm-tossed Atlantic; but neither man panicked. They had set out to accomplish a nonstop flight: safety lay in one direction only, the completion of the project. Towards nightfall, cruising at 4,000 feet, the weather worsened for the Vimy with its indicated speed of a mere 120 mph. Driving sleet blasted the course. Once for a few moments a patch of sky cleared, allowing Brown to shoot his position, but for three hours afterwards the men could see neither sky nor sea and were flying by sheer genius of interpretation of their faulty instruments.

Then, suddenly, the plane spun. The airspeed indicator, stuck at 90, had quit cold. Alcock figured the pitot tube might have been damaged when the generator propeller was carried away—either that or just plain ice. Alcock fought the Vimy with acrobatic skill almost to the waves. Happily, by this time the gas load had been appreciably lightened. He related. "When we cleared the overcast, the machine was almost in the sea. Leaping wave crests actually washed the undercarriage. But now I had visual reference and, with the airspeed shaken into some semblance of indication, I climbed back to 6,000 feet to get on top. We did get between two layers."

The layers, however, came together quickly and the plane ran headlong into a blizzard of snow and hail. The radiator shutters jammed with ice and engine temperatures shot up. Brown climbed up time and again to chip it free with his knife. The airspeed indicator again went completely on the fritz with frozen particles. Neither man spoke a word during the next six hours while they struggled ahead with Brown futilely endeavoring to take a reading to determine accurately their position. At the height of the storm the inter-communication system was practically useless. The men were unable to exchange orders or queries and shouts could not be heard above the roar of the engines and the clatter of the sleet.

Shortly before dawn, Alcock made a desperate effort to get above the overcast so Brown might have a chance to fix their position. He clawed the lightened plane to 11,000 feet.

"At this height we saw the sun break through the clouds several times," Alcock reported, "and Brown was able after several attempts to take a bearing. I decided thereafter to drop close to the sea to try

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for improved visibility. On the sea the wind force was powerful from the southwest. Brown pointed a more southwesterly course to counteract this wind and we followed the corrected bearing for 40 minutes, cruising just above the waves. Although not certain of our exact position, we had a fair idea of where we were. Then, out of the mist, we saw the islands of Eeshal and Turbot emerge and knew we were almost exactly on course. In fact, the mainland became visible only when we were right over it."

Ten minutes later, the original pioneers of nonstop flight across the Atlantic sighted the masts of Clifden radio station, which they circled, firing Very lights but without being observed.

"We allowed this to the fact that no one expected us to make the flight," Alcock said later in London "but now we were desperately in need of a place to land. We circled also over Clifden town and fired more signals but it seemed everyone was so soundly asleep that not even the drone of the engines could awaken them."

The men next returned to the vicinity of the radio station and near here sighted a field which appeared firm enough for landing. When, however, the Vimy touched down, the field turned out to be a typical Irish bog. The plane's wheels sank at the end of the landing run and she tipped up until resting on her nose. Neither man was injured. Alcock and Brown had practised crash procedure for emergency landing on bumpy ground or for ditching at sea. The two were clambering from the plane when a score of employees from the radio station arrived. They presumed the Vimy was on a routine scouting flight along the coast and would not at first believe that the two men were Alcock and Brown who had just flown nonstop from Newfoundland. But soon they rushed back to the radio station to alert the world of the first uninterrupted conquest of the Atlantic.

The Vickers Vimy had covered a total flying distance of 1,880 miles in 15:57 hours at an average speed of 116 mph. Throughout the flight Brown had been able to take only four accurate readings, but when they arrived in Ireland they were less than ten miles off course.

Alcock and Brown were awarded the 10,000 pounds (then worth about $50,000) prize by the London newspaper. King George V conferred a knighthood on each. And the long line of heroes who fought the Atlantic from Eric the Red onward till man learned to fly above its weather must have stood up in Valhalla and applauded two true knights. END

After almost ten years in South Africa as a newspaper reporter, 40-year-old Bill Wharton has retired to England where he does free-lance writing for British and American periodicals.

ANSWER TO WHERE AM I?
(See Page 64)

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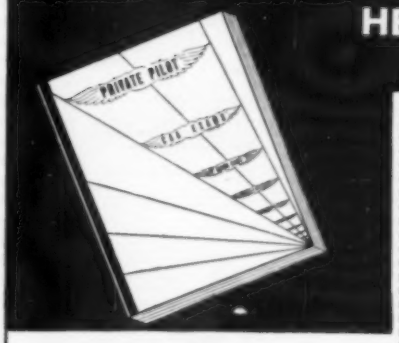

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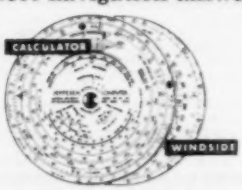

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A Designer Looks at the Small Plane

(Continued from page 29)

one know what the coefficient was! Every designer had his own pet theory which he locked in the safe at night. The coefficient could only be determined from wind-tunnel tests—and such tests were either non-existent or of dubious accuracy. So the designer simply cut down on what he could see—the fuselage cross-sectional area. It was then a case of whether the passengers should hit their heads on the cabin roof or be crammed in sideways. Side-cramming won out.

Actually, it was once considered impossible to make a small plane to seat two persons side-by-side—the drag would be prohibitive, they said! Consequently, the original lightplanes were tandem seaters. C. G. Taylor, designer of the original *Cub*, however, thought otherwise and brought out the Taylorcraft side-by-side model. He guessed right. The drag-coefficient dropped even though the cross-sectional area increased. The new effect was a faster airplane. Today, any and all lightplanes could be easily widened several inches without any ill effects. It's simply that the designers overdo the deeply ingrained habit of shaving weight by shaving dimensions. The cost of the material saved is in pennies. Then too, add six inches to the rear seat and the designer gets a malevolent gleam in his eye—"we'll jam *three* people in," he announces. And the rat race starts again.

Side-by-side seating had another obstacle to overcome. Before the war, it was solemnly accepted by everyone that a pilot could not be trained unless he sat in the center of the airplane. I remember that in 1935, while learning to fly a Spartan low-wing lightplane, we were told to correct in turns for the off-center position by shifting our eyes from one side to the other side of the single cylinder of the three-cylinder engine sticking up in front. I'm convinced that it only loused up our turns. But such things were gospel then.

The same argument went for cabins versus open cockpits. No one then could see how you could learn to fly without having your head out in the breeze. Many design features now current in small planes actually had to overcome prejudices and ignorances of operators; added to that were prejudices and ignorances of designers—and you had something.

All-metal construction was another hassle. The designers said it would be too heavy and expensive. The operators said it couldn't be repaired. I recall this situation very well when I designed the all-metal "Mercury" in 1940. It was a high-wing, two-place, side-by-side, cantilever-wing job. It was even going to have a retractable tricycle gear. We decided to scuttle all the taboos in one crack. Of course, it was said that a cantilever wing on a small plane would be prohibitive in weight and cost (although they had been building such planes in Europe for several years previously). Neither proved true. In fact, Ercoupe, which came out about the same time, had a lighter wing than comparable strut-braced types. Both the Mercury and Ercoupe wing structures were patented and were cheap-

er to build than the conventional types. None of the arguments against such designs were valid.

The simple truth of the matter is that, *at that time*, people building tubing and fabric planes didn't know how to stress analyze sheet-metal structures! In fact, I know of several abortive designs that first had a combination of tubing and sheet-metal fuselages. They didn't trust the thin shell structure to hold the engine weight.

Most of the old prejudices and taboos—on the part of designers and operators, have given way with the passage of time, until today we have lightplanes which could have been built 20 years ago.

One of the bugaboos of the private owner and the designer is cost. It apparently isn't appreciated today any more than it was 20 years ago that the designer has very little control over the cost of the airplane. It is impossible for him to substantially reduce the cost even by the most radical design arrangement since the expensive parts of the plane are not under his control. The engines, propellers, wheels and instruments are bought from others. The only part of the plane he can control costwise is the structure—and he can save only so much material and labor and eliminate only so many tools and fixtures needed to build it. So don't blame the designer for the impossible. But don't listen to all the traditional guff either, why certain things can't be done. Maybe he can give you another inch or so in the rear seat. Make him work for it! END

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Let There Be Sight

(Continued from page 43)

way to scan the earth and sky for other aircraft? All those instructors you've known have been pretty sharp about spotting other planes; how do they do it? Did any of them ever tell you a method for doing it?

It's probably written down somewhere and you just haven't read it. Could you figure this thing out, using your medical knowledge of the eye, together with your flying experience? It's worth a try.

A great deal has been written about the use of vision during flight. How does the eye really work? Actually, the whole area of vision in front of you is divided into two parts:

1. the central vision where you focus your sight sharply:

2. the peripheral vision, that is, the sectors above, below, and off to the sides of the central focus, where you don't see things so sharply. If you look directly at a single letter on a printed page, it will stand out sharply. The rest of the page and all of the area around it extending 90 degrees to each side and about 60-70 degrees above and below, are seen but not sharply and somehow differently. You will have different uses for these two different kinds of vision. But there is another important thing about the eye.

Most of the time, your eyes do not move in a steady continuous motion. They move most naturally in quick jerky movements, shifting the central vision or focus from point to point. When you read a line of print, your eyes jump along a series of six or eight points, and your peripheral vision takes in the spaces between. Your eye makes a smooth continuous motion *only* when it is focused on a steadily moving object.

Heading back toward Caldwell, try to put these facts to use. Let's pick out a fairly distant object below the horizon. There's the Delaware and Lackawanna rail junction at Port Morris. Now be careful to focus your central vision *clearly* on the junction—don't just stare blankly at it. Hold your central vision steadily on it—*and try to be aware of moving objects in your peripheral vision.* Doing this for several seconds, you are aware of a moving object on the nearby road to Netcong. Wait—don't let your eye follow its natural tendency to jump over and focus central vision on the moving object. Hold your central vision on the fixed object, on the rail junction, until you have become aware of *as many moving objects as you can*, in your peripheral vision. After several seconds, you are aware of more moving objects, a commuter train snaking along the north fork of the junction, three automobiles and a tractor-trailer along the road to Kenvil. Only after your peripheral vision has picked up as many of them as possible, do you let your central vision look at them directly.

How long do you have to hold your central vision on a distant object, like the rail junction? The time will vary, five or six seconds perhaps, when you are starting to practice this method, but much less time as you get more experience.

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You have to practice it, it won't come quickly or naturally. You have to overcome the tendency of the eye to jump around quickly, flitting from object to object, and especially onto moving objects. When you have practiced long enough, you will find that you can focus central vision quickly on the distant fixed objects. And you will find that eventually you don't have to look directly at any moving objects that your peripheral vision picks up—your peripheral vision will keep track of most of them for you, and your central vision can be used for those more important nearby moving objects which are getting too close.

Let's try this some more. Approaching close to Caldwell, the omni needle is getting erratic. There doesn't seem to be much on which you can fix your central vision. But there are ridges, clumps of trees, some small lakes. And there are the crossed runways at Morristown. Let's fix central vision on the runway crossing . . . two, three, four, five seconds; and there it is, a tiny moving pinpoint on base leg, over the grey woodland—nothing else moving in peripheral vision. Then the little speck is touching down, but you haven't looked directly at it, with central vision. You can follow it without doing that. You have won your first victory over your eyes—and with them.

How to organize your method of scanning, to cover the entire area of visibility around you? First, look to the right, out and a little to the rear, below the horizon, on that small pond. Hold your central vision there, until your peripheral vision reports to you. Now, turn to 30 degrees left of center, to a group of hospital buildings. Now switch back to the other side, 45 degrees to right of center, into a golf course—hold it there. Now back to the left, 90 degrees to port, directly on Caldwell Wright Field. Next, straight ahead, on a drive-in theater screen. Finally, to the left and rearward, again on a golf course. With this back-and-forth type of scanning, you don't keep looking to one side too long. There is less chance of something crawling up on your blind side.

But what about above the horizon? Most of us have less trouble seeing other aircraft above the horizon than below it. But again, you have to be looking. Perhaps you can spend less time on this area of the sky above the horizon—but don't forget to fix your central vision on an object, even if it is a distant wisp of cloud or a steady patch of smoke haze. Remember that if you let your central vision stare blankly into space, your peripheral vision can't do its job properly.

Getting in close to your destination at Teterboro, you want to sharpen your eye, there's lots of traffic here. Those far-off big twins look so tiny down there on the runway, but they are up and under you in no time. Don't let your eyes be hypnotized by them, though, or their little brothers, either. Don't keep looking at the nearest one while another may be creeping up on you unnoticed. Keep using The Method . . . keep looking . . . and looking . . . and looking . . .

You touch down at Teterboro, unstrap

(Continued on page 88)

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(Continued from page 87)

1397 Charlie, and hurry back to the office, to put The Method down on paper with a diagram or two.

And a little more thinking on the subject will help, too. This new use of your eyes is quite different from their use during operation of your automobile—as different as piloting is from driving. When you are driving your car, the stationary and moving objects which may be hazards to you are so big and so near that your eyes have little difficulty in picking them up. But to use the eye properly for scanning in the air, you need practice and more practice to speed up your time of fixation, and to shorten the time needed by your peripheral vision to make you aware of moving objects. *For almost without exception you will see another aircraft in your peripheral vision first,* whether you plan it that way or not. So why not train your central and peripheral vision to do the job as quickly and as thoroughly as possible?

Will you get enough practice with The Method if you practice only during actual flight? If you're like me, you won't. So take every opportunity on the ground to practice it. Practice it whenever you are in a high building or on a ground elevation a little above and some distance away from a busy airport. Practice it whenever you can look out over a stretch of water or open field where birds are flying. Try it whenever you are in the woods and want to spot any slight movement of leaf or underbrush.

Will The Method find all of the other aircraft around you? Certainly not. But it will make for greater safety for everyone, especially for you and for the other fellow who is using it at the same time. *Remember:*

1. Focus your central vision on a stable fixed point, whether above or below the horizon?

2. Hold it there until your peripheral vision makes you aware of any and all moving objects.

3. Plot a series of these fixed points for central vision, which will cover the area of visibility around you.

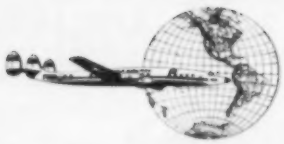
4. Never stare blankly in the general direction of a fixed object—The Method loses 60 per cent of its efficiency when you do.

5. Don't let your eye jump *unnecessarily* to any moving object picked up by the peripheral vision. Again The Method loses efficiency during actual motion of the eye.

6. Always let your eyes adapt to the darker terrain if you shift your scan from bright sky to below the horizon.

7. Practice . . . practice . . . practice . . . whether on the ground or in the air.

Faced with the practical problem of doing what one pilot may to contribute to his own and to general air traffic safety, The Method has been of inestimable help to the author. The proportion of physicians who have become pilots is said to be high in comparison to other professions. From their numbers may come ideas stemming from their scientific knowledge. And if ever general aviation needed self-help, it is now. END



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POPULAR PHOTOGRAPHY
. . . on sale June 3

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Weather for Me

(Continued from page 35)

inadequate.

Weatherwise, the C.A.A.'s responsibility, generally speaking, is only to communicate *current* information periodically. This is obtained from the weather bureau and then transmitted at a scheduled time. It is a wonderful service. However if you do not have radio, or if you require a forecast, the airport station of the weather bureau is the only place to check.

When talking to the weathermen, the questions I put to them were:

1. How should I properly request weather for a complete pre-flight briefing?
2. Can they tell me with reasonable accuracy what I might expect in the way of weather tomorrow?

To my first question, they answered that if it is not possible to visit the weather bureau in person where the most complete briefing can be given, then I should first of all *identify myself as a private pilot.* The bureau receives untold calls from individuals checking to see if they can have a picnic, or can leave their cars out all night.

Then they said I should tell them whether I am flying VFR, or IFR, the type aircraft; my point of departure; my destination; and my time of departure. They told me the Airman's Guide would furnish me with the unlisted phone numbers of all weather bureaus. If I was fairly new to flying, they would like to know this. It assists them in giving advice or opinions I might request. With this information in hand, the weatherman is in a position to give any particular pilot information of real value.

First of all, he could tell me whether, with my qualifications, the trip could safely be made. If weather was marginal at the time, he might suggest that I wait an hour or two. He might also suggest an alternate route, if one is available. He will tell me in general terms of conditions when I would arrive at my destination. If asked, he would suggest a favorable altitude, and give the wind velocity, direction and temperatures at this altitude. As an example, one of the weathermen pointed out that in July or August he might even suggest an altitude with headwinds as being more desirable than one with tailwinds, if the latter were at a lower level where extreme turbulence might be expected. He would give me the general en route weather and could tell me with reasonable accuracy about conditions for the next 18 to 24 hours.

Now, you will say that this is no more than a terminal forecast. And you are absolutely correct. However, it has been interpreted and explained by an expert. You can undoubtedly see by now, the answer to my first question has almost answered my second.

The answer to this second question, of course, is—"Yes, the weather bureau can tell me of conditions for almost 24-hours in advance." This forecast has a good degree of accuracy and will give me a fair

(Continued on page 91)

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FLYING CALENDAR

May 31-June 1—Air Show featuring contests, demonstrations and displays with trophies and cash prizes at the Bridgeport (N. J.) Airport sponsored by the Woodbury (N. J.) CAP Squadron. All pilots welcome.

June 1—Flight breakfast to Austin (Minn.) Airport sponsored by Austin Pilots' Club, Inc. Rain date: June 8.

June 1—Annual "C. R. Hoser Memorial" proficiency race sponsored by CAP Sq. 904. Open to all pilots. Write: Anthony Q. Testone, PIO, CAP Sq. 904, 319 Oak Park Rd., Lansdale, Pa.

June 5-7—Fifth Annual Air Tour of Missouri Pilots Association to Moberly, Mexico, Farmington, St. Charles and Hannibal on Friday; Kirksville, Memphis, Macon, Lexington and Excelsior Springs on Saturday. Sunday will be spent enjoying recreational facilities around Excelsior Springs.

June 6-7—Ninth Annual Maintenance & Operations Meeting, Reading Aviation Service, Inc., Municipal Airport, Reading, Pa.

June 6-8—1958 Spring Cruise of the Aero Club of Pittsburgh to Nags Head, N. C. Pilgrimage to the Wright Brothers Memorial at Kitty Hawk includes cocktail party, banquet, floor show. Land at Manteo Airport, stay at Carolinian Hotel and cottages. Write Charles Ernst, Ch., 1443 Potomac Ave., Pittsburgh 16, Pa.

June 8—Aviation Fair at Halsmer's Airport, Lafayette, Ind., featuring fly-in breakfast and dedication of 4,000 ft., hard-surfaced runway. For details, contact: Marion Dellinger, Halsmer's Flying Service, Halsmer's Airport, Lafayette, Ind.

June 8—Fourth Annual Jaycee Chicken Bar-B-Cue at Goshen (Ind.) Airport. Fly-In, Drive-In. Contact: Robert Hepler, Box 525, Goshen, Ind.

June 12—Seventh Annual Skylady Derby, efficiency air race for women pilots, 640 miles. Contact: Ruth Nickell, Nat'l Ch., 904 Nickell Rd., Topeka, Kan.

June 14—Air Mail Pioneers 40th Anniversary Ball at Beverly Hilton Hotel, Beverly Hills, Calif.

June 14, 15—Second annual South Bass Island Wing Ding at Put-in-Bay, Ohio. Treasure hunt, fish dinner, dance. Overnight accommodations assured by reservation only. Contact: Newell P. Witte, Box 172, Port Clinton, Ohio.

June 15—Annual CAP Airshow, Lee Airport, Annapolis, Md. Barbecued dinners. Rain date, June 22.

June 15—Fly-in of Waco owners at Bloomington, Ill. Airport in conjunction with Experimental Airplane Association. Rain date, June 22.

June 15—Breakfast Fly-in at Columbia (Calif.) Airport sponsored by Tuolumne County Pilots Assoc. Ham & egg breakfast served from 0800 to 1100 at $1.25 per plate. Transportation to interesting spots nearby available.

June 15—Try-outs for American Parachuting Team (Skydivers) at Vancouver, B. C.

June 15—Annual Breakfast Flight to Oshawa Airport, Oshawa, Ontario, Canada, sponsored by Ontario Cy. Flying Club. Signal lamp control and Unicom 2 122.8. Advise of arrival one week in advance. Customs for U. S. visitors. Contact: C. Warne, Pub. Dir., Ontario Cy. Flying Club, P. O. Box 413, Oshawa, Ontario.

June 22—Fourth Annual Crab Feed, Tofino Airport, West Coast Vancouver Island, sponsored by the Aero Club of B. C. and Vancouver Flying Businessman Club. Crabs supplied, but bring own lunches. Floats and wheels, 5,200-ft. paved runways. Rain date, June 29.

June 22—Dawn Patrol by CAP Squadron, Monroe, Mich.

June 28-29—Eleventh Annual Moonlight Flight of Porterville Area Pilots Association. For details, contact: PAPA, 1110 Mill St., Porterville, Calif., or phone Sunset 4-3870.

June 29—Fifth Annual Ranch Style Fly-in Breakfast, Bluffton Airport, Bluffton, Ohio, sponsored by the Bluffton Flying Club.

July 4, 5—Fly-in to 32d Annual Northern California Championship Rodeo—parades, barbecues, dancing — sponsored by Willits Frontier Days, Inc. Contact: Ernestine G. Godwin, Willits Airport, Willits, Calif.

July 4-6—All-American Aviation Exposition, Connellsville-Pittsburgh Airport, Connellsville, Penn., featuring "History of Flight," Antique Aircraft, Experimental (Home-built aircraft). For information, write: All-American Aviation Exposition, 210 Semple St., Pittsburgh, Penn.

July 4-6—1958 Central Texas Soaring Meet at Georgetown (Tex.) Municipal Airport, host: Austin Div. of Texas Soaring Assoc.

July 4-6—Northeastern States Soaring Meet at Harris Hill, Elmira, N. Y. For information, contact: Jack Wilkins, 763 Hazel St., Elmira, N. Y., or Howard Burr, 635 Mt. Zoar St., Elmira, N. Y.

July 4-8—Twelfth Annual All-Woman Air Race from Montgomery Field, San Diego, Calif., to Municipal Airport Charleston, S. C. For information, write: AWTAR headquarters, 2611 East Spring St., Long Beach 6, Calif.

July 5—Sportsmen Pilots Handicap Air Race at Morgan Hill, Calif. Contact Thomas C. Buck, sponsor, 13106 Galway St., Garden Grove, Calif.

July 5-12—Fourth Annual Northwest International Soaring Contest, Wenatchee, Wash.

July 6—Tri-City Airman's Assoc., Annual Air Show at Morgan Hill, Calif.

July 12-14—Air Cruise to the Grand Bahama Club, West End, Grand Bahama Island, B. W. I., sponsored by the Fla. Aero Club, Inc. For details, contact Harry B. Collins, Air Cruise Dir., 375 N.E. 154th St., N. Miami, Fla.

July 16-22—Jaycee Air Cruise, Philadelphia to Mexico City, Mexico. Single and twin aircraft owners and families invited. Participants aircraft fee, $30. Contact: Marc Saunders, Air Cruise Ch., Jr. Ch. of Comm. of Phila., 121 South Broad St., Philadelphia, Pa.

July 20—Sixth Annual Fly-in Breakfast sponsored by Pottstown Unit AOPA, at Pottstown Airport, Limerick, Pa. Rain date, July 27th.

July 22-27—National Model Plane Championships, Glenview Naval Air Sta., Ill.

July 27—Fourth International Air Show at Bellingham (Wash.) Airport, sponsored by the Bellingham Jaycees with the cooperation of the Bellingham Ch. of Commerce and Sportsman Pilots of Washington. Competitive events, exhibits, trophies, fly-in breakfast. Contact: R. C. Graham, Chairman, 1958 Air Show, Bellingham Jr. Ch. of Commerce, 1210 Cornwall Ave., Bellingham, Wash.

July 29-Aug. 7—Twenty-fifth National Soaring Contest at Bishop, Calif., sponsored by Soaring Society of America. Contact: Lloyd M. Licher, P. O. Box 66071, Los Angeles 66, Calif.

August 8-10—Sixth Annual Experimental Aircraft Fly-in and Sport Aviation Meet, Curtiss Wright Airport, Milwaukee, Wis. Everyone welcome. Write: Paul Poberezny, EAA, Hales Corners, Wis.

Aug. 11-15—National Flying Farmers Assoc. 1958 convention at Hotel New Yorker, New York, N. Y. Teterboro Airport, Teterboro, New Jersey will be used to base NFFA planes. Contact: Exec. Sec'y, NFFA, Municipal Airport, Wichita 13, Kan.

Aug. 14—Ninth International Air Race (for women pilots) sponsored by Fla. Ch. of Ninety-Nines and the Grand Bahama Club, from Welland, Ontario, Canada to Grand Bahama Club, West End, Grand Bahama. Six cash prizes totalling $2,000. This is a handicap, daylight race. For details, contact: Miss Irma Price, 242 S.W. 8th St., Miami, Fla.

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(Continued from page 89)

picture of what to expect on my return trip. This does not imply that I can return on the following day without checking again; nor does it mean anything like 100 per cent accuracy. It does mean a much higher percentage of success than I was having heretofore which means dollars to me, to say nothing of the nervous tension it has eliminated.

A commercial pilot, in addition to checking the weather himself, has the advice of his Company's meteorologist. The private or business pilot must depend upon the service offered by Government. We must use it intelligently.

Last, but perhaps most important, make a friend of your weatherman—know his name—and let him know yours. This will help when you want to obtain a little personalized service. As a suggestion, I have included a copy of the weather briefing form I use. It may give the reader ideas for making one of his own. END

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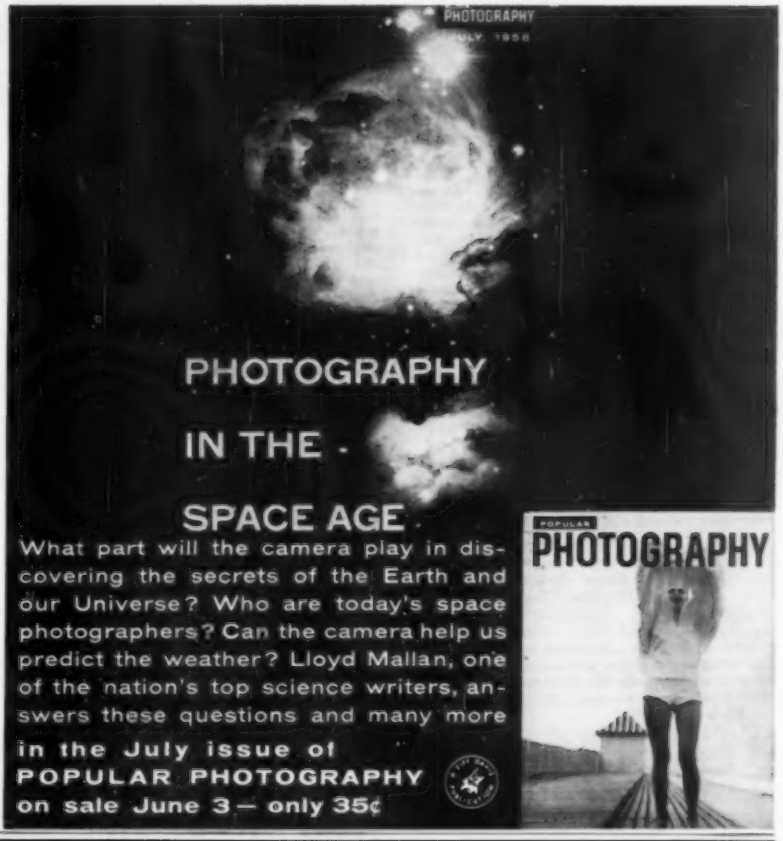
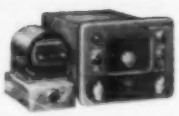


What part will the camera play in discovering the secrets of the Earth and our Universe? Who are today's space photographers? Can the camera help us predict the weather? Lloyd Mallan, one of the nation's top science writers, answers these questions and many more in the July issue of POPULAR PHOTOGRAPHY on sale June 3— only 35¢

AR-1 AIRCRAFT TRANSMITTER-RECEIVER



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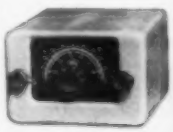

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A new, economically-priced series of FM and AM receivers for communications monitoring and emergency applications in the VHF region. Complete with AC power supply, speaker, "built in" antenna, calibrated slide rule dial. Each has 8 tubes plus rectifier. Oscillator is temperature compensated, has low radiation. Excellent AVC and adjustable squelch.

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Prices include microphone, one crystal, canvas carrying case

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A new Communicator, ideally suited for airport use. Identical in size and general appearance to Model 3111. Available for operation on any fixed frequency from 25 to 300 mcs. Price includes microphone and crystals.

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140A's: 5 available. All metal, ±RGZR/CF, has 300 hours SMOH. Metal propeller. Primary blind. Omnirange. Clean. Relicensed January. $3500. Powers & George, 475 Fifth Avenue, New York 17, N. Y.

170's: 17 from $3850. 1954, 170B, ±GFRX/CF, has 495 hour remanufactured engine. Painted 1955. LF. Lear LTRA-6 omnimeter. Simplexer. ADF-12D. Relicensed April. Clean. Hangared. $6350. Powers & George, 475 Fifth Avenue, New York 17, N. Y.

180's: 16 available. 1953, ±XZXT/AF, has 150 hours SMOH. Gyros. LF. Omnigator. ADF-12. One owner. Relicensed. Bargain. $8000. Powers & George, 475 Fifth Avenue, New York 17, N. Y.

182's: 12 from $9850. Painted, 1956, ±RFZT/BF, has 370 hours. New metal Hartzell. Beacon. Gyros. LF. Omnigator. Simplexer VC-27. ADF-12. Relicensed December. Try offer $10,800. Powers & George, 475 Fifth Avenue, New York 17, N. Y.

310 TWINS: 12 available. 1955, ±GQS/NF, has zero SMOH. Gyros. LF. LVTR-36 VHF. ARC-15D omnirange. ADF-14E. Extras. Hangared. Undamaged. Clean. Bargain. $32,000. Powers & George, 475 Fifth Avenue, New York 17, N. Y.

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Briefings . . .

(Continued from page 10)

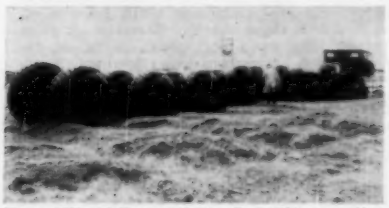
than an ordinary 5-inch speaker; no shock mounting is necessary and weight is 22 ounces complete. A four-page folder gives complete details.

TWO TWIN BATTERIES of the Navy's Terrier guided missile stand ready for launching on the afterdeck of the USS Canberra, the second cruiser to be outfitted with this Convair-built beam-riding missile. Two aircraft carriers, three conventional cruisers, the nuclear cruiser Long Beach, and nine frigate-class ships also are to be equipped with Terriers. Launched by a powerful rocket booster, the Terrier by its own propulsion unit is carried along on a radar beam to the target. It has a ceiling of more than 50,000 feet.

TO ITS TWO-YEAR Engineering Technology Curriculum, Northrop Aeronautical Institute of Inglewood, Calif. has recently added an Electronics Major, in recognition of the increasing inter-relationship of the aircraft, guided missile and electronics industries. A selective subject, Northrop students in the Engineering Technology may now major in Electronics if they so desire.

DATA COMPILED by the Dow Chemical Co., Midland, Mich., on their experience with new low-cost pole type buildings, including hangars, is available upon request. Booklets are entitled "Low Cost Pole Buildings for Industry" and "Pole Buildings."

CALLED A FLUID TRANSPORTER, this unusual new fuel train, made up of ten huge, 500-gallon-capacity rubber tire bags, can transport 5,000 gallons of fuel or other liquids over rugged terrain under any conditions. The tires are a development of Goodyear; the train, of the



Four Wheel Drive Auto Co., Clintonville, Wis., for the U. S. Army Transportation Research and Engineering Command. Towing the fuel train is a "pillow-tire" FWD Teracruzer, of the type used by the AF for ground support of the Matador missile.

COMPLETION OF A NEW HANGAR at Houston Int'l. Airport—on the old National Guard facility—by Houston Executive Air Service, Inc., has somewhat relieved the lack of facilities for private aircraft in that area. The new service company, with Reg Robbins as general manager, acquired an old hangar with the facility and now both old and new hangars are in service, offering complete mechanical and service facilities, including starting equipment and fuel for jet aircraft.

AIMED AT SPEEDING claims and service on Narco communications and navigation equipment, the National Aeronautical Corp., has instituted a new formula for major improvement in its customary 90-day warranty. The new concept provides for free bench test and repair work at any Narco-designated service agency, now 80 in number, and to be increased to 150 in the near future.

WEATHER-SHIELDED "Aero-Gangplank" is an innovation for the comfort of United Air Lines' passengers at Chicago's O'Hare Field. A three-section ramp, designed by Lockheed Air Terminal, Inc., Burbank, Calif., it is attached at second

floor level to the terminal and telescopes from 55 feet out to 107 feet. A pivoting device allows a 120-degree swing for perfect fit to the plane's fuselage. Two supports, one fixed and one mobile, absorb the gangplank's weight.

THE 19th Edition of Aero Publisher's book, "Civil Air Regulations & Flight Standards for Pilots," is now available from the publishers at 2162 Sunset Blvd., Los Angeles 26, Calif., bookstores, airport operators or dealers, for $2.25.

ESSENTIAL INFORMATION for pilots planning foreign flights is to be found in great detail in CAA's new "International Flight Information Manual." On sale for 50 cents at the Government Printing Office, Washington 25, D. C., the 112-page publication includes a directory of major airports, including airports of entry; foreign entry and flight requirements; air navigation aids and other information covering 146 countries and territories.

FIFTH EDITION of "U. S. Aviation Today" is available through the National Aviation Education Council, 1025 Connecticut Ave., N.W., Washington, D. C. Prepared by the Aircraft Industries Association, the 1958 edition of 125 pages includes a new chapter on guided missiles in addition to photos and brief descriptions of all U. S. aircraft in production during the past year (within the limits of military security). Price is $.75.

GROUND CREWS at Republic Aviation have replaced the traditional hand waves used in flight line tests with supersonic engines, with a novel five-way radio system. A self-powered system, consisting of an ear muff-type headset receiver,

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TWO BUSINESS PILOTS are principals in "Aircharters," a firm organized to set up a chain of air charter services for business transportation. Operators who enroll in the network are provided with promotional materials, bookkeeping services, uniform telephone listings, reduced insurance and equipment costs and, through exchange of equipment, a diversification of available aircraft which no one operator could support. Located at 75 E. Wacker Dr., Chicago, Ill., the firm's president is John A. Kuhnen; its vice president, Norman O. Mick, Jr.

LIGHTWEIGHT and easy to install, this Remote Indicating Compass kit is being offered by Aircraft Components, Inc., Benton Harbor, Mich., for the price of

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ESCAPE VELOCITY—the minimum speed required to propel planes or missiles out of the earth's gravitational field into space—has been exceeded in a wind tunnel test at ARDC's Arnold Engineering Development Center in Tullahoma, Tenn. Lasting about one-tenth of a second at test-run peak, an airflow of 32,400 mph was achieved; or a recorded speed of about nine miles per second. It is the first time escape velocity—seven miles per second—ever has been reached in a wind tunnel.

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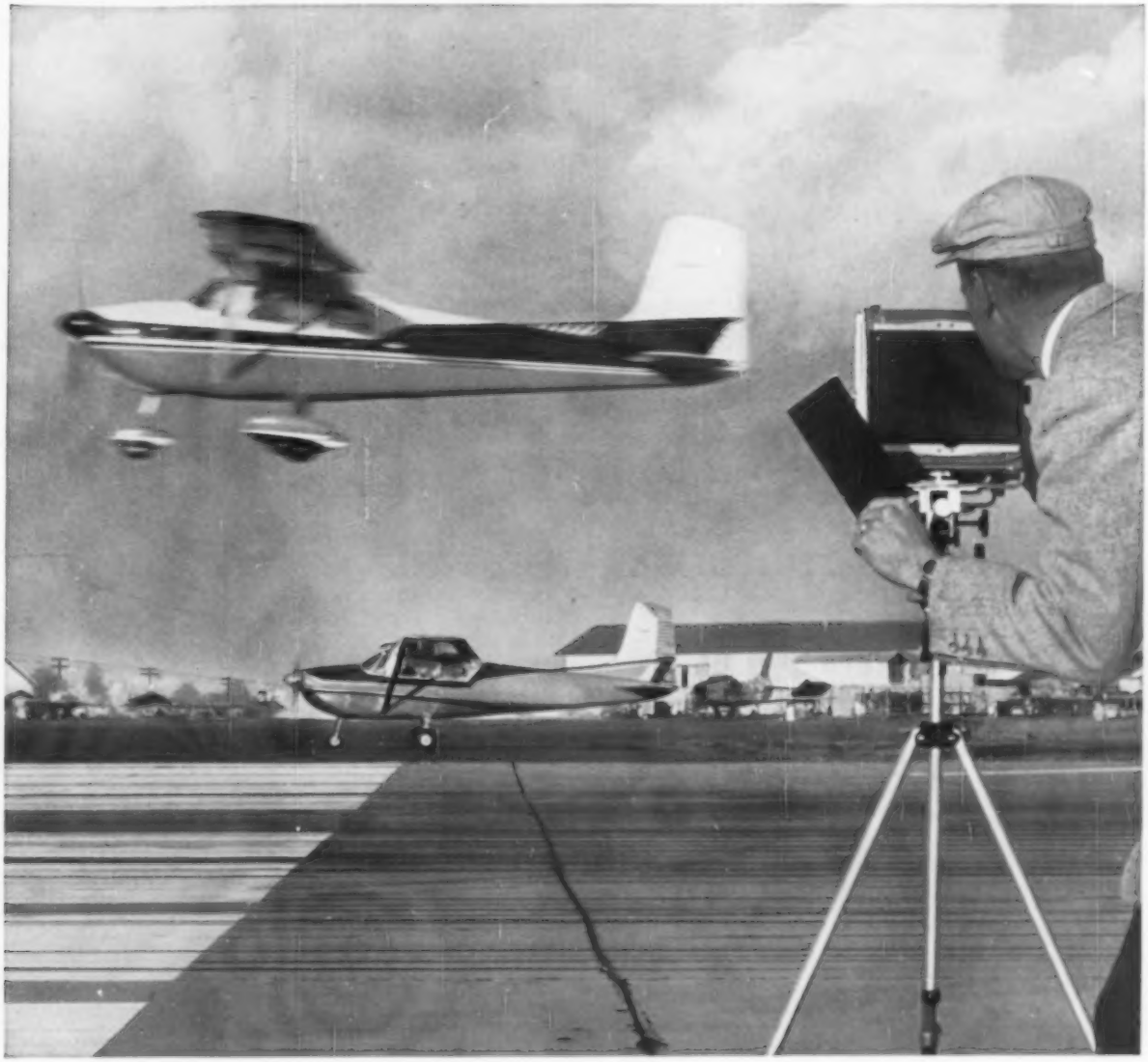

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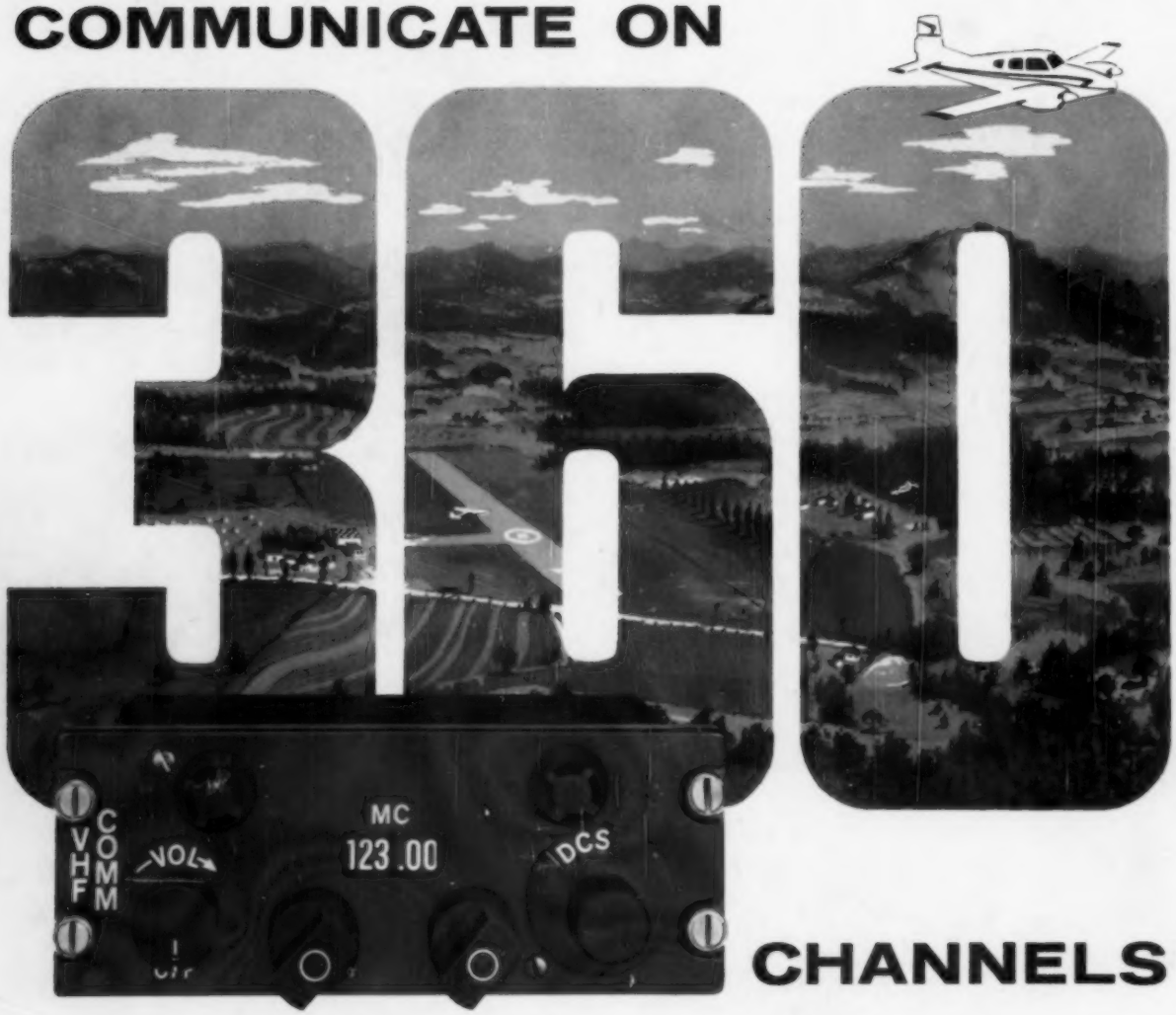

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10-CHANNEL ISOLATION AMPLIFIERS • OMNIRANGE SIGNAL GENERATORS AND STANDARD COURSE CHECKERS • 900-2100 MC SIGNAL GENERATORS

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